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April 10, 2018

VIA E-MAIL – **DDTCPublicComments@state.gov**

Richard Koelling
Acting Director, Office of Defense Trade Controls Policy
Directorate of Defense Trade Controls
U.S. Department of State
2401 E St. NW, Suite 1200 (SA-1)
Washington, DC 20522

Re: Request for Comments Regarding Review of U.S. Munitions List Categories V, X, and XI

Dear Mr. Koelling:

In reviewing the Department of State's Notice of Inquiry ("NOI") on behalf of our clients, we noticed a technical issue in U.S. Munitions List ("USML") **Category XI(c)(15)** that we believe warrants further review and possible revision in order to align that entry with its counterpart in the Missile Technology Control Regime ("MTCR") Annex and to enhance clarity, usability, and efficiency.

USML Category XI(c)(15) controls the following items:

> Electronic assemblies and components, capable of operation at temperatures in excess of 125°C and specially designed for UAVs or drones controlled by USML Category VIII, rockets, space launch vehicles (SLV), or missiles controlled by USML Category IV capable of achieving a range greater than or equal to 300 km (MT)

We are concerned that the use of the term "capable of" in reference to "operation at temperatures in excess of 125°C" (and prior to the "specially designed" control) is ambiguous and impractical because it captures items using a performance capability that may be unknown to the manufacturer or exporter. While it is often unlikely that an electronic assembly or component can operate above 125°C without any effort to make it do so, it is also often theoretically possible that the same item could operate at such temperatures for at least some limited period of time.

Under the current control, the use of the term "capable of" pertaining to the temperature threshold could be read to suggest that an item is controlled even if it is never operated in a test or operating environment at temperatures in excess of 125°C, and even if the exporter or manufacturer: (a) does not know the item can operate at 125°C; (b) has no design intent to have the item operate above 125°C; (c) does not test whether the item can, in fact, operate above 125 °C; and (d) has made no effort to make the item capable of operating at or above 125°C. Thus, Category XI(c)(15) could be interpreted to require manufacturers or exporters to submit every electronic assembly or component specially designed for use in a relevant system to testing at temperatures in excess of 125°C to confirm whether the items are "capable of" operation at such temperatures, regardless of any design intent or actual operational requirement. We believe this would result in an absurd and costly outcome that the agencies did not intend.

Notably, this USML control also does not currently align with the MTCR control upon which the USML control is a corollary. The MTCR control makes clear that items not designed for operation at temperatures in excess of 125°C should not be captured, as MTCR Annex 11.A.4 controls the following: "[e]lectronic assemblies and components, designed or modified for use in [rocket systems] and specially designed for military use and operation at temperatures in excess of 125°C."

In addition, the MTCR Annex Handbook's description of the "nature and purpose" of this control underscores that it is meant to capture only assemblies and components that are actually intended to be used at high temperatures, not any assembly or component that may be "capable of" operating at such a temperature regardless of design intent, testing, or actual operation:

> The limited space on rocket systems and UAV systems requires the design and manufacture of small yet very capable (high power and density) systems. *If the electronics can be designed to withstand high temperatures*, then weight from materials otherwise required for cooling can be avoided. Electronic assemblies and components used in such situations *result from extensive design and testing efforts to ensure reliability when used in high-temperature environments*. The underlying purpose of rugged, heat-tolerant electronic items is to ensure weapons system performance and reliability while minimizing weight and space.

MTCR Annex Handbook, p. 263 (emphasis added)

Because of the concerns described above and the lack of consistency with the MTCR, we recommend that the Department of State revise Category XI(c)(15) to address these concerns. One possible revision is the following:

> Electronic assemblies and components, specially designed for operation at temperatures in excess of 125°C and specially designed for use in UAVs or drones controlled by USML Category VIII or rockets, space launch vehicles (SLV), or missiles controlled by USML Category IV, capable of achieving a range greater than or equal to 300 km (MT)

We believe that such a revision would make that USML entry clearer to industry and more aligned with the MTCR basis for its control.

Thank you for the opportunity to comment on the NOI. If you have any questions regarding these comments, please feel free to contact me via email at semme@akingump.com or via telephone at 202-887-4368.

Sincerely,

Steven C. Emme

cc: Engda Wubneh, Office of Defense Trade Controls Policy

Foster, John A

From: Borges, Terry <Terry.Borges@analog.com>
Sent: Friday, April 13, 2018 1:56 PM
To: DDTCPublicComments
Cc: Neylon, Shaun
Subject: DOS-2017 "Request for Comments Regarding Review of USML Categories V, X and XI.

Dear DDTC,

Thank you for the opportunity to provide input regarding USML Categories V, X and XI.

Following are our comments for your consideration. Please let us know if you have any questions or would like additional information.

There has been active development work in the past few years, both in academia and industry, towards the implementation of low-cost commercial Active Electronically Scanned Array (AESA) antenna systems for non-military weather radar and for applications such as satcom (GEO, MEO, or LEO systems, eg. OneWeb and LeoSat), cellular or Point to Multipoint communication systems (eg. mmW 5G). We believe at least one such AESA-based commercial satcom system has already been deployed (e.g. Gilat's RaySat ESA/PAA Mobile Satcom Antenna terminal) and numerous projects are underway at various companies around the world to develop and produce phased array antennas for mmW 5G, with commercial deployment starting this year already (see references below). Furthermore, highly integrated beamformer ICs which incorporate phase-shifter and amplification functions in a package for use in such antenna systems have been introduced on the market by both US companies (such as Anokiwave) and foreign ones (such as RFCore).

The recent update to the Department of Commerce CCL has a specific control for Transmit/ Receive or transmit only (T/R) modules with phase-shifters under section 3A001.b.12, and such control has been ratified by other Wassenaar countries. However, to our knowledge, these other countries do not have additional controls specific to phased array antenna technology as those imposed by the US Department of State such as those listed in USML Category XI paragraphs (c)(4) and (c)(10). The breadth and ambiguity of these controls as currently listed place US companies at a disadvantage with respect to their competitors in being able to serve an international market for such products. While the CJ review procedure can resolve uncertainties as to the applicability of these controls to specific products, the delays involved with this process create a serious impediment to providing a timely response in line with customer's expectations. We discuss details of these USML paragraphs of concern below.

A) Category XI(c)(4) currently controls:
"Transmit/receive modules or transmit modules that have any two perpendicular sides, with either length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [d≤15cm*GHz/f GHz], with an electronically variable phase shifter or phasers that are a Monolithic Microwave Integrated Circuit (MMIC), **or** incorporate a MMIC or discrete RF power transistor."

The wording of this paragraph was changed from the one previously published in 78 FR 45018, namely:

"Transmit/receive modules or transmit modules that have any two perpendicular sides, with either length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [d≤15cm*GHz/fGHz], that incorporate a Monolithic Microwave Integrated Circuit (MMIC) or discrete RF power transistor **and** a phase shifter or phasers;"

This modification was made by the Department ostensibly in response to a comment that this previous wording "would inadvertently control transmit/receive modules or transmit modules of a certain size that contain either an electric or a mechanical phase shifter or phaser." However the current wording is extremely ambiguous and appears to change the intent of the original construct in the use of an "or" conjunction instead of "and" as highlighted above, and the original version was already ambiguous in the description " (MMIC) or discrete RF power transistor", which we assume what was meant to be: " (MMIC) or discrete transistor RF power amplifier", the implication being that the module must contain an electronically variable phase shifter and that no further power amplification would be required external to the T/R module to drive the corresponding antenna element in the array. Furthermore, as previously mentioned, the new section 3A001.b.12 of the CCL specifically covers such AESA T/R modules and includes in the control specific output power threshold vs. frequency and size threshold that is a function of the number channels, and commercial AESA products that make use of T/R modules are being introduced to the market. We therefore believe that the XI(c)(4) control is now largely redundant and should be removed from the USML. If not, then at the very least it should be written in less ambiguous terms, limited to defense articles only, and with power limit equal or greater than that specified in 3A001.b.12 of the CCL, for example:

"Transmit/receive modules or transmit modules specifically designed for defense articles, with peak saturated output power Psat (in Watts) greater than 505.62 divided by the maximum operating frequency (in GHz) squared [Psat>505.62 W*GHz^2/fGHz^2], and having any two perpendicular sides, with either length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [d≤15cm*GHz/f GHz], with a Monolithic Microwave Integrated Circuit (MMIC) or discrete transistor RF power amplifier, and an MMIC electronically variable phase shifter or phaser."

B) Category XI(c)(10) controls (except for Traffic collision Avoidance Systems (TCAS Equipment)):

"Antenna, and specially designed parts and components therefor, that:
(i) Employ four or more elements, electronically steer angular beams, independently steer angular nulls, create angular nulls with a null depth greater than 20 dB, and achieve a beam switching speed faster than 50 milliseconds;
(ii) Form adaptive null attenuation greater than 35 dB with convergence time less than one second;
(iii) Detect signals across multiple RF bands with matched left hand and right hand spiral antenna elements for determination of signal polarization; or
(iv) Determine signal angle of arrival less than two degrees (e.g., interferometer antenna).

To enable multi-user operation with a high-level of spectral efficiency, 5G mmW base station antenna systems to be deployed in the next couple of years will need to perform beam steering and nulling functions that meet the criteria of one or both of (i) and (ii) above, and null steering functionality may well be required for satcom antenna systems as well, especially as the density of satcom platforms is expected to increase dramatically over the next few years. Any part or component specially designed for such antenna systems could therefore fall under this control as well. We would suggest the best remedy for this would be to eliminate these paragraphs altogether. Short of this, a limitation should be added to the category specifying that it applies only for uses in or with defense articles, or at the very least would explicitly exclude non-military communication systems.

In addition to the changes suggested above for the USML category XI controls, we urge the Department to also consider changing Category XV paragraph (e) (1) to exclude antenna systems designed for commercial communication satellites as this limitation again puts US providers of associated custom components such as beam-former ICs for such systems at a competitive disadvantage to participate in the markets for both space- and non-space phased array platforms that share common technologies, due to the restrictions on the choice

of IC fabrication processes and other manufacturing facilities that can be used for development and production of each, as well as the additional operational costs associated with ITAR restrictions in general.

References:

http://www.oneweb.world/#technology
RaySat ESA/PAA
http://www.phasorsolutions.com/phasors-technology
https://www.businesswire.com/news/home/20180103005755/en/Verizon-Selects-Samsung-5G-Commercial-Launch
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https://onestore.nokia.com/asset/201377/Nokia_5G_Beamforming_mMIMO_White_Paper_EN.pdf
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Regards,
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April 13, 2018

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Reference

A. Comments on Category XI (a)(3)

(1) Current USML Category XI (a)(3)(xii): Radar incorporating pulsed operation with electronics steering of transmit beam in elevation and azimuth;

NOTE TO PARAGRAPH (a)(3)(xii): This paragraph does not control radars not otherwise controlled in this subchapter, operating with a peak transmit power less than or equal to 250 watts, and employing a design determined to be subject to the EAR via a commodity jurisdiction determination (see §120.4 of this subchapter).

Findings: Power use is a critical design parameter of a civil commercial device and minimizing power while achieving desired function is very important. The 250W peak transmit power level is a good differentiator between civil commercial and military radars. However, the requirement to obtain a commodity jurisdiction creates additional compliance burden impacting the time to market and putting U.S. companies at a disadvantage in developing civil commercial products incorporating such radars versus international competitors.

Recommendation: We request removing the current note and adding the peak power transmit power level to the control in XI(a)(3)(xii).

Proposed Language:

*(xii) Radar**, operating with a peak transmit power greater than 250 watts,** incorporating pulsed operation with electronics steering of transmit beam in elevation and azimuth;*

(2) Current USML Category XI (a)(3)(xvi): Radar that detects a moving object through a physical obstruction at distance greater than 0.2 m from the obstruction;

Findings: Presence and motion detection are important in Internet of Things (IoT), safety, and health systems. Integration of radar into these systems to work with other sensor technologies is being investigated by the civil commercial industry to improve function, performance, and accuracy.

Detecting moving objects through a physical obstruction is of critical importance for civil commercial applications such as security, safety, search & rescue by first responders, autonomous vehicles, etc. Radar is an essential technology for such applications due to its inherent capability to see through physical articles or things. There are several foreign companies that already market commercial products with capabilities that see through physical obstructions.

a) Vayyar (https://vayyar.com) is an Israeli company offering a chip-based imaging solution for commercial applications in smart home, automotive, smart retail, and robotics.
b) Novelda (https://www.xethru.com) is a Norwegian company that offers solutions for occupancy sensing, sleep monitoring, and respiration monitoring.
c) InnoSent (https://www.innosent.de/en/) is a German company that offers radar technology based solutions for home automation, security, traffic monitoring, automotive, collision avoidance, door openers, etc.

Radars designed for civil commercial applications currently operate in the following frequency bands:

3.1–10.7 GHz, 22–26.65 GHz, 57–71 GHz, 76–81 GHz, and 122-123 GHz. Given the pace of innovation, it is anticipated that civil commercial radars will operate at frequencies up to 240 GHz within the next five years. Please refer to the attached research on high-resolution 240 GHz radar on a chip (https://www.fhr.fraunhofer.de/en/the-institute/core-competencies/High-frequency-systems/High-Resolution-240-GHZ-Radar-with-SiGe-Chip.html).

Recommendation: In order to focus controls on military sensitive applications and to release civil commercial applications from these controls, we recommend adding a frequency-based criteria as shown below.

Proposed Language:

> *(xvi): Radar **operating at frequencies above 240 GHz** that detects a moving object through a physical obstruction at distance greater than 0.2 m from the obstruction;*

(3) Current USML Category XI (a)(3)(xxii): Radar employing automatic target recognition (ATR) (i.e., recognition of target using structural features (e.g., tank versus car) of the target with system resolution better than (less than) 0.3 m);

Findings: It is critical for autonomous vehicles to distinguish between different objects in their path (e.g., bicycle versus pedestrian, car versus bus) to prevent collisions and to ensure the safety of the passengers. The term "automatic target recognition (ATR)" is broad and can unintentionally control the development of radar systems for autonomous vehicles.

Recommendation: In order to focus controls on military sensitive applications and to release civil commercial applications such as autonomous vehicles from these controls, we recommend adding a power-based criteria as shown below.

Proposed Language:

> *Radar **operating with a peak transmit power above 250 watts** employing automatic target recognition (ATR) (i.e., recognition of target using structural features (e.g., tank versus car) of the target with system resolution better than (less than) 0.3 m);*

(4) Current USML Category XI (a)(3)(xxv): Radar that sends and receives communications;

Findings: Sharing information between autonomous vehicles transmitted through radar can improve safe operation. Understanding the status of an oncoming vehicle provides additional data that can be used to improve vehicle control. Critical information can be exchanged between vehicles regarding unanticipated road conditions, road obstructions, sudden changes in vehicle's operational state, and traffic conditions. Previously mentioned frequency ranges are applicable to these radars.

Recommendation: In order to focus controls on military sensitive applications and to release civil commercial applications from these controls, we recommend adding a frequency-based criteria as shown below.

Proposed Language:

*(xxv): Radar **operating at frequencies above 240 GHz** that sends and receives communications;*

B. Comments on Category XI (c)(10)

(1) Current USML Category XI (c)(10): Antenna, and specially designed parts and components therefor, that:

(i) Employ four or more elements, electronically steer angular beams, independently steer angular nulls, create angular nulls with a null depth greater than 20 dB, and achieve a beam switching speed faster than 50 milliseconds;

(ii) Form adaptive null attenuation greater than 35 dB with convergence time less than one second;

(iii) Detect signals across multiple RF bands with matched left hand and right hand spiral antenna elements for determination of signal polarization; or

(iv) Determine signal angle of arrival less than two degrees (e.g., interferometer antenna);

Findings: As mentioned earlier, passenger and pedestrian safety is of utmost importance to autonomous vehicles. Precision is a key factor in achieving safe operation of autonomous vehicles. Additionally, civil commercial radars that can determine an angle of arrival less than two degrees are available in the market today as evidenced in the following product.

a) Robert Bosch Gmbh, a German multinational company, currently markets a long-range radar sensor for civil commercial automotive that has angle of arrival between +/- 0.1 and +/ 0.3 degrees (http://cds.bosch.us/themes/bosch_cross/amc_pdfs/LRR4_292000P0ZH_EN_low.pdf).

Additionally, the civil commercial industry has an interest in developing communication systems that meet or exceed the criteria in (c)(10)(i) for telecommunication applications.

Recommendation: In order to focus controls on military sensitive applications and to release civil commercial applications such as autonomous vehicles from these controls, we recommend adding a power-based criteria as shown below.

Proposed Language:

*(c)(10) **Antenna and specially designed parts and components therefor, operating with a peak transmit power above 250 watts,** that:*

(i) Employ four or more elements, electronically steer angular beams, independently steer angular nulls, create angular nulls with a null depth greater than 20 dB, and achieve a beam switching speed faster than 50 milliseconds;

(ii) Form adaptive null attenuation greater than 35 dB with convergence time less than

one second;

(iii) Detect signals across multiple RF bands with matched left hand and right hand spiral antenna elements for determination of signal polarization; or

(iv) Determine signal angle of arrival less than two degrees (e.g., interferometer antenna);

We appreciate the opportunity to provide information regarding defense articles that have entered into or are anticipated to enter into normal commercial use. Thank you for the opportunity to provide comments and recommendations on the International Traffic in Arms Regulations, USML Category XI.

April 3, 2018

Richard Koelling, Acting Director
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Submitted Electronically

Re: DOS–2017–0017; Notice of Inquiry; Request for Comments Regarding Review of United States Munitions List Categories V, X, and XI

Dear Mr. Koelling,

Ardica Technologies, LLC ("Ardica") is pleased to have the opportunity to submit comments related to the review of USML Category V, specifically Category V(c)(1), which controls:

(c) Pyrotechnics, fuels and related substances, and mixtures thereof, as follows:

(1) Alane (aluminum hydride) (CAS 7784-21-6)

This entry corresponds to Wassenaar Munitions List ML8.c.2. Alane is not listed on the Missile Technology Control Regime Annex and is not identified by the Nuclear Suppliers Group guidelines for transfers of nuclear-related dual-use equipment, materials, software, and related technology (INFCIRC/254, Part 2).

We believe Alane has been controlled as a munitions list item because, traditionally, it had been considered only as a propellant fuel additive for potential military applications. Indeed, Alane was not in widespread use for such applications, and until recently was not the subject of sustained efforts to find commercial uses. Thus, until now, there has been no government or industry incentive to change the level of export controls applicable to Alane.

However, beginning in 2009, Ardica initiated development on the use of Alane as a source of hydrogen for military hydrogen fuel cell applications for the U.S. Army Communications-Electronics Research, Development and Engineering Center ("CERDEC"); and as a source of hydrogen for consumer applications with two major Fortune 500 consumer electronics companies.

Ardica has demonstrated that Alane is a viable source of hydrogen that can power fuel cells, and both military and civilian end-users have expressed interest in the use of such fuel cells. The application is non-lethal and unrelated to the use of Alane in propellants, and typically much smaller quantities are used than in the context of propellant end-use.

Thus, we believe Alane would be better controlled as a dual-use item. Currently, use of even small quantities of Alane in such fuel cells triggers an ITAR export license requirement based on the ITAR's "see-through" concept of jurisdiction. Controlling it on the Commerce Control List/Wassenaar Dual-Use List would maintain export controls over Alane in its raw format, but provide more flexibility with respect to its incorporation into hydrogen fuel cells.

Alternatively, we suggest adding appropriate quality, purity, or other performance parameters to the ITAR's description of Alane to apply controls only to the grade of Alane that is useful for military propellant applications. Another alternative would be to control only propellant mixtures that contain Alane on the ITAR, and control Alane on the EAR, which would eliminate the "see-through" problem as applied to hydrogen fuel cell applications. This approach has a precedent in the way elemental boron is controlled; raw material is controlled under 1C011, but fuel mixtures containing it are ITAR controlled.

1. Description of Product

Aluminum Hydride (AlH_3, commonly called Alane) is an inorganic compound of aluminum and hydrogen. Alane is a polymer that forms numerous polymorphs which differ in their properties and reactivity. Alpha –Alane is the most stable and only practical form of Alane for propellant or hydrogen storage use. Alane in this document refers to stabilized alpha-Alane polymorph.

2. Traditional Use as Propellant Additive and Traditional High Cost of Production

Ardica's understanding is that Alane was included on the USML due to research by the United States and the Former Soviet Union relating to the use of Alane as an additive to propellants used for military applications. Alane operates as an enhancer to such propellants by increasing the specific impulse, reducing the flame temperature, and increasing the solid grain regression rate.

The Soviet Union, Dow Chemical Company, SRI International (SRI), and the Office of Naval Research (with ATK/SRI as contractors) all have successfully made Alane. However, the fuel was very expensive. The expense was due to costly feedstock and producing it in small batches using very dilute solutions of ether, which drove up cost of labor and materials (called batch solvent, or Dow Process).

3. Use as a Fuel Source for Hydrogen Fuel Cells

Alane has been the subject of research for the past eight years as an option for use in fuel cells due to its high energy density, high H_2 (hydrogen) product purity, and simple H_2 generation process. The properties of just the Alane material have been summarized as follows, reflecting its suitability for use in hydrogen fuel cell applications.

- Harmless reaction products – when devolved through the process of generating hydrogen, the remainder is elemental aluminum
- High energy content (>2x dense as liquid H_2 by volume)
- Long shelf life (decades at ambient or lower)
- Supports multiple H_2 release methods
- Simple decomposition that can be controlled for H_2-on-demand by fuel cell power systems
- Theoretical potential for 3970 Wh/L and 1640 Wh/kg on material basis only

The US military has identified a number of possible applications for Alane-fueled hydrogen fuel cells, including for ground vehicles, unmanned air and sea vehicles and soldier-wearable/portable power systems.

In addition, projects are underway to develop commercial Alane power units for Electric Vehicle (EV) Range Extenders, emergency backup power, material handling equipment (fork lifts), public transportation fuel cells, and UAVs.

Commercial adoption has been gated by the traditional high cost of producing Alane, but Ardica has developed a method for manufacturing Alane at a significantly lower cost than the traditional Dow Process. This lower cost of production makes commercial applications and non-propellant military applications feasible. We believe that ITAR regulation is a Catch-22: demonstrating commercial viability is hindered because it is more difficult to engage in research and development projects due to the need to obtain ITAR licenses to engage in collaborative efforts involving foreign nationals or foreign partners.

4. Reasons for Decontrol from the USML and Suggested Movement to EAR Commerce Control List/Wassenaar Dual-Use List

Aside from cost, control under the ITAR inhibits use of Alane in hydrogen fuel cell applications. We believe that moving control to dual-use will accelerate commercial adoption, as it will remove significant licensing burdens and costs from the movement of Alane itself to close allies and eliminate the need for licensing of finished products. Indeed, Ardica has been focusing on military applications due, primarily, to the limitations of having the fuel source subject to ITAR control, as well as items containing small amounts of it being subject to ITAR control, as well, due to the ITAR's "see-through" concept.

Ardica recognizes that Alane can still have military propellant applications, and that dual-use controls are still merited. Ardica proposes that Alane be transferred to ECCN 1C011/WA Dual-Use List ECCN 1.C.11, which currently controls zirconium-magnesium fuels, boron, guanidine nitrate and nitroguanidine. Like Alane, these items have both military and civil applications in propellants and explosive applications. Alane represents no more of an inherent diversion risk than these items, and indeed is not itself an explosive compound, but rather is used as an additive to propellants in the military context, or serves the exact same function - generating hydrogen – when used in military or civil power applications.

Alternatively or in addition, Alane could remain on the ITAR, but only when it is in a form suitable for military propellant use, which could be defined by objective parameters. Alane in a format suitable for civil hydrogen generation applications could be subject to EAR control, at the level of control suitable to address potential diversion concerns.

Ardica stands ready to discuss these comments in more details with interested government agencies, as the public nature of these comments limits the extent to which detailed information can be supplied relating to certain aspects of this request.

Respectfully submitted,

Kristopher J. Lichter
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These comments are provided BAE Systems, Inc., in response to U.S. Department of State Notice of Inquiry: Request for Comments Regarding Review of United States Munitions List Categories V, X and XI. Federal Register February 12, 2018.

Docket Number DOS– 2017-0017

Category X

The revision of USML Category X has had a positive impact on the international business operations of BAE Systems. We believe that the U.S. Government has succeeded in creating a bright line between personal protective equipment (PPE) that warrants the control of the ITAR, and PPE that does not require such stringent controls, based on objective performance parameters that are well understood by both regulators and industry. As a direct result of the transition of lower sensitivity PPE products from the United States Munitions List (USML) to the Commerce Control List (CCL) BAE Systems has been able to quickly and efficiently obtain authorizations for large export sales of these products. Reducing the number of products controlled under USML Category X has eliminated the delays associated with reporting under ITAR 123.15(a)(1). While export of the PPE products that transitioned to the CCL still requires a license, this authorization has been obtained without difficulty. We believe these regulatory changes have made our products more competitive internationally while providing adequate control to achieve U.S. foreign policy objectives.

Category XI

Our experience in the three years since the initial revision of USML Category XI has not been as positive as for USML Category X. Unlike USML Category X, with USML Category XI, the government has

not been as successful in creating a bright line between the products that warrant control as USML defense articles and those that do not. USML Sub-categories XI(a)(1) through (a)(5) control military electronics end items as Significant Military Equipment (SME). Each of these sub-categories identifies "systems" and "equipment" that perform an enumerated controlled function. While the complete end items are enumerated, BAE Systems has had significant difficulty categorizing the major components and accessories for these systems. USML Sub-categories XI(c)(4) through (c)(18) capture specific components for selected systems but they are often not applicable to our particular products. USML Sub-categories XI(c)(1) through XI(c)(3) function more as general "catch-all" listing that capture ASICS and PLD's programmed for defense articles and printed circuit boards, populated circuit card assemblies and multichip modules for which the layout is specially designed for unspecified defense articles. Our experience has been that in practice, the structure of the revised USML Category XI leaves a gap between the complete end item system and the individual parts and components listed in USML Sub-category XI(c). The current language of USML XI(c)(1) through XI(c)(3) does not accurately describe components and accessories as they are actually delivered. Often these components and accessories are designed and delivered as complete Line Replaceable Units (LRU's) or other similar modules and assemblies. While these LRU's may contain ASICS, PCB's, CCA's and multichip modules described in USML Sub-categories XI(c)(1) through XI(c)(3), they are not delivered in this form, but as a complete assembly to be cabled into the larger end item.

Our interactions with U.S. government regulators also suggest that regulators are unsure of how to resolve this issue. BAE Systems' experience has been that the U.S. government often acts to fill this gap by treating items that objectively meet the ITAR 120.45 definition of "component" or "accessory" as the complete end item. This is accomplished by applying the imprecise ITAR 120.45(g) definition of "system" to the particular component or accessory to capture it under the USML Sub-category XI(a) language. We believe that this is not a correct application of the definition of "system." While these

LRU assemblies are more than populated circuit card arrays and do perform "a function," we believe that the function performed individually by these LRU's is not the same or the complete function described under USML Sub-category XI(a). Our military electronic end item products are designed to operate as an integration of several different LRU's. Some of the LRU's are required for operation and others are optional and serve to improve the performance of the system. It is only once these components and accessories are properly integrated that they become a system that performs a function described in the control language of USML Sub-category XI(a).

While classifying components and accessories as the complete end item may be convenient from a regulatory perspective, it also imposes licensing requirements that are higher than they were prior to export control reform. Classifying components and accessories as USML Sub-category XI(a) end items requires that they now be treated as Significant Military Equipment (SME). The sudden imposition of the SME designation on these products has significant negative operational consequences for industry. Complying with the more stringent end use, end user certification requirements adversely impacts our ability to provide spares, repairs and additional components and accessories to both new and established foreign customers. Prior to the revision of Category XI, these were routine hardware shipments. BAE Systems has long established programs to establish foreign manufacturing of these electronic components by our international industrial partners. These efforts are authorized by ITAR Manufacturing License Agreements (MLA's) that have been in place for decades and often involve versions of the products specifically designed for export sales. The effect of sudden upward reclassification of these products as Significant Military Equipment is that even applications for routine or simple changes in scope must now be notified to Congress pursuant to ITAR 124.11(c) and transfer of these items now require a DSP-83. This change has added considerable complexity and delay to the authorization process. It also makes previously available products less desirable to international customers and provides them with a real incentive to design them out of their products. This

contradicts the stated goals of the Export Control Reform initiative. Throughout the Export Control Reform process, industry was consistently assured that that the control level would not be increased on existing products. We have not found that to be true with the revision of USML Category XI. In certain instances, this upward reclassification has been formalized through the Commodity Jurisdiction (CJ) process.

Reclassifying components and accessories for military electronic systems as SME end items is not consistent with the principles or objectives of the Export Control Reform effort that drove the revision of USML Category XI. If the U.S. Government believes that these components and accessories to military electronic systems still warrant the more stringent controls of the ITAR, we urge the U.S. Department of State to create appropriate language to control them as non-SME defense articles. This language should be contained within USML Sub-category XI(c). A possible solution would be to create a new sub-category within USML Sub-category XI(c) that captures assemblies and modules containing defense articles described in USML Sub-category XI(c)(1), XI(c)(2), or XI(c)(3) or to modify USML Sub-categories XI(c)(1), XI(c)(2), and XI(c)(3) to cover these components and accessories.

The Boeing Company
929 Long Bridge Drive
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April 13, 2018

Sarah Heidema, Acting Director
Office of Defense Trade Controls Policy
Directorate of Defense Trade Controls
Department of State
SA–1, 12th Floor
Washington, DC 20522–0112

Subject: Request for Comments Regarding Review of USML Categories V, X and XI, Docket No. DOS–2017–0017

Via email: DDTCPublicComments@state.gov

Dear Ms. Heidema:

Thank you for the opportunity to provide comments on the *Notice of Inquiry on USML Categories V, X, and XI,* published February 12, 2018. The Boeing Company ("Boeing") strongly supports regular reviews of the United States Munitions List ("USML") and the work by the Directorate of Defense Trade Controls ("DDTC") to more precisely describe the articles warranting control under the International Traffic in Arms Regulations ("ITAR"). Our comments relate to certain controls and terms used in USML Category XI, Military Electronics.

Category XI controls, unless carefully defined and calibrated, have the potential to inadvertently reach into commercial technologies. Comments (1), (2), and (5) herein seek to explain the current and future commercial applications of technologies now controlled on the USML. Boeing believes that several of the revisions we propose are necessary to avoid capturing under the ITAR items and technologies that have equivalent and appropriate EAR controls. We encourage DDTC to consider the wide international availability of these electronic systems and technologies currently enumerated on the USML, and refine the control parameters of Category XI to grant U.S. businesses a more even playing field in a highly competitive commercial market.

Specific Comments:

1. **<u>USML XI(a)(3)(i)</u> should be revised to exclude commercial air-to-air radar and address current uncertainty of the term "airborne," as discussed below.**

A. Commercial Air-to-Air Radar Comments

All air-to-air radar ("ATAR") available today have tracking capability because processing power has advanced to the point that including tracking functionality is simple and affordable. Current commercial tracking radars known to Boeing are classified under the ITAR or are not yet classified for export. These are:

- Echodyne - maker of auto and commercial unmanned airborne systems ("UAS") radars, 3.4km range (https://echodyne.com/wp-content/uploads/2017/08/MESA-SSR_Product_Sheet.pdf)
- Harris Exelis – commercial UAS radar (https://www.harris.com/solution/unmanned-aerial-systems-uas)
- UAVradars (http://uavradars.com/radar/)
- Fortem (https://fortemtech.com/fortem-trueview-radar/)
- Aerotenna (https://aerotenna.com/datasheets/AerotennauSharppatchDatasheet.pdf)

The rapid growth of the commercial UAS market is also driving the Federal Aviation Administration ("FAA") to develop airspace safety regulations. The Radio Technical Commission for Aeronautics ("RTCA")[1], which advises the FAA, is developing draft standards for unmanned aircraft to assure their safe operation in the National Airspace System ("NAS"). These standards will become the basis for future FAA regulations for UAS. RTCA standards relevant to ATAR are:

1) Minimum Operation Performance Standards ("*MOPS*"), RTCA Paper No. 261-15/PMC-1400
2) Minimum Operation Performance Standards for air-to-air Radar ("*MOPS for Radar*"), RTCA Paper No. 170-16/ SC228 034

The *MOPS* defines a Detect and Avoid ("DAA") system to assure UAS maintain a safe operational distance from normal air traffic hazards. ATAR is specified as required equipment within the DAA system standards, to detect surrounding traffic and stay well clear of non-cooperative aircraft (i.e., aircraft operated without a transponder). ATAR is specified in the *MOPS for Radar* as required technology for all UAS aircraft transitioning to and from different classes of airspace within the NAS.

There are two DAA equipment classes within the standards, which both require ATAR systems with tracking functionality.

- Class 1 contains the basic DAA equipment and requires a minimum of airborne surveillance technologies for detecting traffic: 'ADS-B in' (a receiving system for information on all transponder-based aircraft in the vicinity), active surveillance (a transponder, which could include 'ADS-B out' - a broadcast system for aircraft information), and an ATAR system.
- Class 2 is a Class 1 system that also integrates a TCAS II[2] system for enhanced functionality.

---

[1] The RTCA is a private, not-for-profit association founded in 1935. Utilized as a federal advisory committee, RTCA works in response to requests from the FAA to develop comprehensive, industry-vetted and endorsed recommendations for the federal government on issues ranging from technical performance standards to operational concepts for air transportation. See https://www.rtca.org/.

[2] TCAS II is an aircraft collision avoidance system designed to reduce the incidence of mid-air collisions between aircraft.

Relevant provisions of the *RTCA MOPS* (underlining added):

> *Executive summary*
> *The intended function of the radar is to detect and generate tracks for all airborne traffic within the radar detection volume. The onboard radar complements other airborne surveillance sensors by providing detection of non-cooperative traffic.*
>
> *2.2.1.3 Air-to-Air Radar (ATAR)*
>
> *"The ATAR is an airborne sensor that* ***shall (014[3])*** *comply with the MOPS for Air-to-Air Radar for Traffic Surveillance (RTCA DO-TBD, (RTCA Paper No. 170-16/SC228-034)). ATAR is the main surveillance source for non-cooperative intruders in a DAA system. The intended function of the radar is to generate tracks for all intruders within the radar detection volume. The radar can operate in the C, X, or Ku frequency bands of the Aeronautical Radio Navigation Spectrum (ARNS). Usage of a particular frequency will depend on the type of operation and may require coordination with the FCC (at the time these MOPS were published, many of the frequencies overlapped currently used aviation frequencies, which could degrade performance). The onboard radar will be the sole surveillance sensor for all aircraft that do not carry transponders or ADS-B equipment. The DAA system also makes use of radar data to validate ADS-B data."*

The *MOPS for Radar* specification defines one implementation for the DAA system where the radar sends the radar-generated tracks to the DAA processor which will create unified tracks that will combine information from all sensors. It also states that the radar electronics provide all transmit, receive, control, status and tracking functions for the radar. Accordingly, this is an airborne tracking radar. It must be able to simultaneously track a minimum of 20 objects. The range requirement for the ATAR is defined as 7.2 NM with 0.5 degree azimuth accuracy; however the standard currently only accounts for aircraft traveling at 170 knots True Airspeed (KTAS), so it will need to be revised for faster aircraft.

It appears that the current U.S. export control regulations do not contemplate commercial tracking ATAR. USML Category XI(a)(3)(i), as written, controls all airborne tracking radar. ECCN 6A008 would capture this commercial technology, but there is no carve-out on the USML for commercial tracking ATAR. Without a revision to category XI, the use of any tracking ATAR being contemplated for UAS to assure safe airspace will be ITAR controlled.

B. "Airborne" Comments

The term "airborne" is not defined, so if a civil automotive radar classified as EAR99 is installed on an aircraft the question arises whether it is now an "airborne radar"

[3] Bold in source document.

that is classified as ITAR. Small commercial automotive radar systems are available globally and easily adaptable to a UAS. They are being used by UAS developers today in their DAA systems. For example:

- Microwave Journal (an industry publication) highlights the use of radar sensors. (http://www.microwavejournal.com/articles/29573-using-24-ghz-radar-to-speed-commercial-uav-adoption)
- Infineon, a German manufacturer, has written a white paper on how to install an automotive radar on a rotocopter. (https://www.infineon.com/dgdl/Infineon-White_paper_Radar_solutions_for_multicopter-WP-v01_00-EN.pdf?fileId=5546d4625f96303e015f9bdc06506c5a)

C. Recommended Revisions to XI(a)(3)(i)

Boeing's comments on this control text in our September 9, 2013 response to DDTC's Proposed Rule revising USML Category XI (78 FR 45018) discussed the potential capture of weather cells and the capture of development projects for UAS collision avoidance in airspace where transponders are not required. DDTC modified the control text to accommodate weather phenomena, but did not discuss or modify the text as it relates to UAS. As shown above, the use of ATAR on UAS will be required for safety reasons. An ITAR control that does not delineate between military and commercial radars will only slow down U.S. technology developments while capabilities abroad continue to advance. Accordingly, Boeing reiterates the need for revision and again proposes the technical thresholds we recommended in 2013. Boeing suggests the following revisions to XI (a)(3)(i).

(a) Electronic equipment and systems not included in Category XII of the U.S. Munitions List, as follows:
**(3) Radar systems and equipment, as follows:*
(i) Airborne radar that maintains positional state of an object or objects of interest, other than weather phenomena, in a received radar signal through time ***and has any of the following characteristics:***

a. Specially designed for a military end use;
b. A range greater than 14 nm for a 0dBsm target; or
c. An azimuth accuracy of less than 0.25 degrees

The "specially designed" qualifier in the proposed XI(a)(3)(i)(a) resolves the issue of non-commercial radar being used on aircraft. The criteria in subparagraph (b) represent the capability of current civil traffic avoidance standards as set forth in TCAS II, see (https://www.faa.gov/documentLibrary/media/Advisory_Circular/TCAS%20II%20V7.1%20Intro%20booklet.pdf). The criterion in subparagraph (c) is double the threshold established in the commercial variant as defined in the *MOPS*, to account for farther detection of faster aircraft projected for future revisions of the *MOPS*. Items released by criteria (b) and (c) will remain controlled under the EAR in CCL category 6A008.

2. USML XI(a)(3)(ix) and (a)(3)(xxvii) should be revised to control only non-commercial products that have performance beyond civil air traffic collision avoidance systems.

Both of these USML control listings impact ongoing commercial development projects by Boeing and others regarding bi-static radar as part of an initiative to develop capabilities to improve flight safety in the vicinity of UAV operations and airports not controlled by traditional air traffic management. The bi-static radar approach will be used as an airborne collision avoidance system for general aviation aircraft and for possible application to civil unmanned aircraft. Essentially the same system as those captured by (a)(3)(xxvii) can be installed at ground-based locations to provide air traffic information regarding aircraft not equipped with transponders to aircraft operating around uncontrolled airports.

DDTC did not accept Boeing's recommendations for these listings in our 2013 comments, stating, "Note 3 to paragraph (a)(3) already addresses this issue" (see p.37538 of the July 1, 2014 Final Rule for Category XI, 79 FR 37536). But Note 3 addresses systems or equipment that require transponders. The safety goal of existing bi-static radar projects is to enable commercial aircraft with transponders to detect objects that do not have transponders – such as general aviation pilots, gliders, UAS, or commercial aircraft whose transponders are not working.

Accordingly, we reiterate our previous recommendation to limit the scope of this control to non-commercial products that have performance beyond the civil air traffic collision avoidance systems. The criteria of greater than 14 nm for a 0dBsm target represents capability beyond the requirements for civil air traffic collision avoidance as set forth in the TCAS II standard (see reference above) and should be added to both listings.

Recommended Revisions to XI(a)(3)(ix) and (xxvii)

XI(a)(3)(ix)

Air surveillance radar ***having all of the following****:* ~~*with multiple elevation beams, phase or amplitude monopulse estimation, or 3D height finding*~~*;*

a. ***multiple elevation beams,***
b. ***phase or amplitude monopulse estimation,***
c. ***3D height-finding*****, AND**
d. ***a range greater than 14 nm for a 0dBsm target***

XI(a)(3)(xxvii)

Bi-static/multi-static radar that exploits greater than 125 kHz bandwidth and is lower than 2 GHz center frequency to passively detect or track using radio frequency (RF) transmissions (e.g., commercial radio, television stations) ***and which is specially designed to have a range greater than 14 nm for a 0dBsm target****;*

3. "Equipment," "systems," and "hardware" references in XI(a)

Controls in Category XI(a) include references to "equipment and systems," to "equipment or systems," to "hardware, equipment, or systems," and simply "equipment." It is unclear whether the use of the word "and" in some subparagraphs and "or" in others is intentional.

- **Recommendations: S**tandardize all entries as "systems and equipment" and add a note to XI(a) to clarify that parts and components of these systems and equipment are not controlled in XI(a), which covers end-item systems or equipment; parts and components are controlled as enumerated elsewhere on the USML or CCL.

4. USML XI(b)

We understand that this temporary control text remains in effect until August 30, 2018, per Federal Register Notice 82 FR 41172 dated August 30, 2017, while a permanent revision is in development. The subparagraph currently controls "systems, equipment, or software, not elsewhere enumerated in this subchapter, specially designed for intelligence purposes that collect, survey, monitor, or exploit, or analyze and produce information from the electromagnetic spectrum (regardless of transmission medium), or for counteracting such activities." As indicated in the FRN, the reason for including "software" explicitly in XI(b) is to ensure that exporters continue to treat as USML-controlled certain intelligence-analytics software. However, XI(d) also controls software directly related to the systems and equipment described in XI(b) (the technical data control in XI(d) includes "[t]echnical data (see §120.10 of this subchapter) and defense services (see §120.9 of this subchapter) directly related to the defense articles described in paragraphs (a) through (c) of this category...," and the definition of "technical data" in §120.10(a)(4) covers "software (see §120.45(f)) directly related to defense articles.") Explicit inclusion of "software" in XI(b) produces control of "directly related" software in both paragraphs, with the XI(b) control superseding since it is identified as Significant Military Equipment. Consequently, software directly related to certain Category XI(b) systems and equipment must be treated as Significant Military Equipment, which is a higher level of control than was in place prior to the revision of USML Category XI in July 2014. We believe that this is an unintended consequence and easily addressable in an interim revision.

In addition, we also note that "intelligence purposes" is not defined in the current control, and a broad interpretation of that phrase (likely not per drafters' intent) could capture--and chill development of--commercial systems. Accordingly, we recommend that DDTC provide a definition of "intelligence purposes" as used in this control.

- **Recommendation:** Revise XI(b) as follows:
  "*(b) Electronic systems, equipment, or software (**not directly related to such systems or equipment**), not elsewhere enumerated in this subchapter, specially designed for intelligence purposes that collect, survey, monitor, or exploit, or

analyze and produce information from, the electromagnetic spectrum (regardless of transmission medium), or for counteracting such activities."

5. **USML XI(c)(5) should be deleted because it captures items available globally for commercial use, including from China.**

Commercial manufacturers have developed electronics which contain high energy capacitors and are used in automobiles, wind turbines, and civil aircraft. This USML control listing covers capacitors already on the commercial market. Examples of capacitors being marketed for commercial applications can be found as follows:

- http://www.maxwell.com/products/ultracapacitors/docs/datasheet_bc_series_1017105.pdf and
- http://www.maxwell.com/products/ultracapacitors/docs/03152013_ds_hc_series.pdf (Chinese version of the datasheet)

As a capacitor does not have inherent military functionality, current EAR controls on these items under ECCN 3A001 are more appropriate.

DDTC did not accept Boeing's recommendation for this control text in our 2013 comments because "the discharge rate and energy life stipulated in the paragraph (c)(5) adequately differentiates those capacitors that warrant ITAR controls from those that are used commercially." However, the ITAR control specifies kilo-joules / kilogram (kJ/kg), and the Maxwell datasheet referenced above has specifications in watt-hours / kilogram (Wh/kg). Once these units are converted (1.3 kj/kg = 0.3611 Wh/kg), all of the commercial capacitors on the referenced datasheet exceed the current USML control threshold.

* * * * *

We appreciate the efforts by DDTC and its partner agencies to solicit and review public comments in order to better define the military electronics and related technologies appropriately controlled in USML Category XI. Please do not hesitate to contact me if you have any questions or need additional information. I can be reached at 703–465–3312 or via email at arthur.shulman@boeing.com.

Sincerely,

Arthur Shulman
Director, Global Trade Controls

April 13, 2018

Submitted via email to: DDTCPublicComments@state.gov

Directorate of Defense Trade Controls
Office of Defense Trade Controls Policy
U.S. Department of State
Washington, DC 20522-0112

Subject: Docket Number DOS-2017-0017, Request for Comments Regarding Review of USML Categories V, X and XI.

Dear Sir or Madam:

The Computing Technology Industry Association (CompTIA) is a non-profit trade association serving as the voice of the information technology industry. With approximately 2,000 member companies, 3,000 academic and training partners and nearly 2 million IT certifications issued, CompTIA is dedicated to advancing industry growth through educational programs, market research, networking events, professional certifications and public policy advocacy.

Thank you for the opportunity to provide comments on this rulemaking regarding the review of USML Categories V, X and XI.

I. Comments regarding USML Category XI paragraph (b) modification

The USML provides the following language for Category XI(b):

> *(b) Electronic systems, equipment or software, not elsewhere enumerated in this subchapter, specially designed for intelligence purposes that collect, survey, monitor, or exploit, or analyze and produce information from, the electromagnetic spectrum (regardless of transmission medium), or for counteracting such activities.*

Before suggesting changes to XI(b), we would like to provide the DDTC a list of CCL entries which may overlap with Category XI(b).

a. ECCN 3A002.c.4 of the CCL captures certain signal analyzing equipment using performance-based criteria:

3A002.c.4 "Signal analyzers" having all of the following:
a. "Real-time bandwidth" exceeding 170 MHz; and

b. Having any of the following:

b.1. 100% probability of discovery, with less than a 3 dB reduction from full amplitude due to gaps or windowing effects, of signals having a duration of 15 µs or less; or

b.2. A "frequency mask trigger" function, with 100% probability of trigger (capture) for signals having a duration of 15 µs or less;

Technical Notes:

1. Probability of discovery in 3A002.c.4.b.1 is also referred to as probability of intercept or probability of capture.

2. For the purposes of 3A002.c.4.b.1, the duration for 100% probability of discovery is equivalent to the minimum signal duration necessary for the specified level measurement uncertainty.

Note: 3A002.c.4 does not apply to those "signal analyzers" using only constant percentage bandwidth filters (also known as octave or fractional octave filters).

Items captured by ECCN 3A002.c.4 are subject to National Security controls. We believe that this ECCN entry adequately controls COTS signal analyzers that meet or exceed the control thresholds of this entry.

b. ECCN 5A001.e of the CCL captures certain direction-finding equipment using performance-based criteria:

5A001.e Radio direction finding equipment operating at frequencies above 30 MHz and having all of the following, and "specially designed" "components" therefor:

1. "Instantaneous bandwidth" of 10 MHz or more; and
2. Capable of finding a Line Of Bearing (LOB) to non-cooperating radio transmitters with a signal duration of less than 1 ms;

Items captured by ECCN 5A001.e are subject to National Security controls of the EAR. The Related Controls section of the ECCN also guides the exporter to evaluate their products against USML Category XI for certain direction-finding equipment.

c. ECCN 5A001.f of the CCL broadly captures interception or jamming, and monitoring equipment:

5A001.f Mobile telecommunications interception or jamming equipment, and monitoring equipment therefor, as follows, and "specially designed" "components" therefor:

1. Interception equipment designed for the extraction of voice or data, transmitted over the air interface;
2. Interception equipment not specified in 5A001.f.1, designed for the extraction of client device or subscriber identifiers (e.g., IMSI, TIMSI or IMEI), signaling, or other metadata transmitted over the air interface;
3. Jamming equipment "specially designed" or modified to intentionally and selectively interfere with, deny, inhibit, degrade or seduce mobile telecommunication services and performing any of the following:

a. Simulate the functions of Radio Access Network (RAN) equipment;
b. Detect and exploit specific characteristics of the mobile telecommunications protocol employed (e.g., GSM); or
c. Exploit specific characteristics of the mobile telecommunications protocol employed (e.g., GSM);

4. Radio Frequency (RF) monitoring equipment designed or modified to identify the operation of items specified in 5A001.f.1, 5A001.f.2 or 5A001.f.3.

Note: 5A001.f.1 and 5A001.f.2 do not apply to any of the following:
a. Equipment "specially designed" for the interception of analog Private Mobile Radio (PMR), IEEE 802.11 WLAN;
b. Equipment designed for mobile telecommunications network operators; or
c. Equipment designed for the "development" or "production" of mobile telecommunications equipment or systems.

N.B. 1: See also the International Traffic in Arms Regulations (ITAR) (22 CFR parts 120-130). For items specified by 5A001.f.1 (including as previously specified by 5A001.i), see also5A980 and the U.S. Munitions List (22 CFR part 121).
N.B. 2: For radio receivers see 5A001.b.5.

Items captured by ECCN 5A001.f.1 are subject to Surreptitious Listening controls and to *Nota Bene* 1. N.B. 1 requires the exporter to consider reviewing the controls of the USML. Here, too, the EAR contains Related Control guidance to refer to the ITAR (USML Cat XI(a)(4)(iii) for certain electronic attack and jamming equipment).

Items captured by ECCN 5A001.f.2, 5A001.f.3, and 5A001.f.4 are subject to National Security controls of the EAR. The "Related Controls" guidance applies to these ECCN subparagraphs as well.

d. ECCN 5A980 is related to 5A001.f.1 and is intended to be a catch-all for surreptitious interception devices not controlled by 5A001.f.1:

> *5A980 Devices primarily useful for the surreptitious interception of wire, oral, or electronic communications, other than those controlled under 5A001.f.1; and "parts," "components" and "accessories" therefor.*

Similar to items captured by ECCN 5A001.f.1, we believe that there could be overlap between 5A980 and the USML, and the exporter would need to request a CJ for items potentially captured in ECCN 5A980. Should the CJ determine the item was subject to the jurisdiction of the ITAR, the result of the CJ would most likely be to classify the item in XI(b).

After a review of the above ECCNs, we believe Category XI(b) is redundant and captures items already adequately controlled by ECCNs in 3A002 and 5A001 in the EAR for National Security reasons.

ECCNs 3A002 and 5A001 control items that meet the control criteria even if they are not specially designed for intelligence purposes. We believe the existing EAR controls are broad enough to control items that may fall under current XI(b) control of the USML. Based on the analysis above and to reduce the heavy ITAR compliance burden on industry, we respectfully recommend the removal of XI(b) from the USML or to change the current control to:

> *(b) Electronic systems, equipment or software, not elsewhere enumerated in this subchapter, specially designed for military end user that collect, survey, monitor, or exploit, or analyze and produce information from, the electromagnetic spectrum (regardless of transmission medium), or for counteracting such activities.*

To ensure consistency across the subchapter, we propose applying the "Note to Category XII", copied below, also to Category XI.

> *Note to Category XII: For purposes of paragraphs (b)(6), (c)(1)(iii), (c)(3), (c)(4)(ii), (c)(5), (c)(6)(viii)(b), and (c)(7)(ii) of this category, a "military end user" means the national armed services (army, navy, marine, air force, or coast guard), national guard, national police, government intelligence or reconnaissance organizations, or any person or entity whose actions or functions are intended to support military end uses. A system or end item is not specially designed for a military end user if the item was developed with knowledge that it is or would be for use by both military end users and non-military end users, or if the item was or is being developed with no knowledge of use by a particular end user. For the purpose of conducting a self-determination of jurisdiction, documents contemporaneous with the development must establish such knowledge. For*

the purpose of a Commodity Jurisdiction determination, the government may base a determination on post-development information that evidences such knowledge or is otherwise consistent with §120.4 of this subchapter.

II. Drafting or other technical issues in the text of Category XI(c)(4)

The USML provides the following language for Category XI(c)(4):

> *Transmit/receive modules or transmit modules that have any two perpendicular sides, with either length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [d≤15cm*GHz/fGHz], with an electronically variable phase shifter or phasers that are a Monolithic Microwave Integrated Circuit (MMIC), or incorporate a MMIC or discrete RF power transistor*

As noted by the text underlined below, ECCN 3A001.b.12 of the CCL captures certain transmit/receive modules and MMICs using a dimensional analysis that is identical to XI(c)(4):

> *3A001.b.12 'Transmit/receive modules,' 'transmit/receive MMICs,' 'transmit modules,' and 'transmit MMICs,' rated for operation at frequencies above 2.7 GHz and having all of the following:*
>
> > *a. A peak saturated power output (in watts), Psat, greater than 505.62 divided by the maximum operating frequency (in GHz) squared [Psat > 505.62 W * GHz2/fGHz2] for any channel;*
> >
> > *b. A "fractional bandwidth" of 5% or greater for any channel;*
> >
> > *c. Any planar side with length d (in cm) equal to or less than <u>15 divided by the lowest operating frequency in GHz</u> [d ≤ 15cm * GHz * N/fGHz] where N is the number of transmit or transmit/receive channels; and*
> >
> > *d. An electronically variable phase shifter per channel.*
>
> *Technical Notes:*
>
> *1. A 'transmit/receive module' is a multifunction "electronic assembly" that provides bi-directional amplitude and phase control for transmission and reception of signals.*
>
> *2. A 'transmit module' is an "electronic assembly" that provides amplitude and phase control for transmission of signals.*
>
> *3. A 'transmit/receive MMIC' is a multifunction "MMIC" that provides bi-directional amplitude and phase control for transmission and reception of signals.*
>
> *4. A 'transmit MMIC' is a "MMIC" that provides amplitude and phase control for transmission of signals.*

*5. 2.7 GHz should be used as the lowest operating frequency (fGHz) in the formula in 3A001.b.4.12.c for transmit/receive or transmit modules that have a rated operation range extending downward to 2.7 GHz and below [d ≤ 15cm * GHz * N/2.7 GHz].*

6. 3A001.b.12 applies to 'transmit/receive modules' or 'transmit modules' with or without a heat sink. The value of d in 3A001.b.12.c does not include any portion of the 'transmit/receive module' or 'transmit module' that functions as a heat sink.

7. 'Transmit/receive modules' or 'transmit modules,' 'transmit/receive MMICs' or 'transmit MMICs' may or may not have N integrated radiating antenna elements where N is the number of transmit or transmit/receive channels.

Items captured by ECCN 3A001.b.12 are subject to National Security controls of the EAR and license exception LVS applies for exports less than $5,000.

The control XI(c)(4) is a good example of a broad control for items that are either already in normal commercial use or will be in commercial use in the next two to three years. Accordingly, we respectfully request DDTC to remove the control XI(c)(4) from ITAR as it unintentionally catches a wide variety of civil commercial commodities.

III. Drafting or other technical issues in the text of Category XI(c)(8)

The USML provides the following language for Category XI(c)(8):

Digital radio frequency memory (DRFM) with RF instantaneous input bandwidth greater than 400 MHz, and 4 bit or higher resolution whose output signal is a translation of the input signal (e.g., changes in magnitude, time, frequency) and specially designed parts and components therefor;

Following the release of XI(c)(8), efforts have been made to clarify the phrase *Digital Radio Frequency Memory (DRFM)* to be understood as an item designed for use in electronic warfare applications. Therefore, we have attempted to narrow the scope of XI(c)(8) to only cover specially designed parts or components of electronic warfare systems or equipment captured in specific subparagraphs in XI(a) and all of XI(b):

Digital radio frequency memory (DRFM) ***specially designed for systems or equipment enumerated and controlled within Category XI (a)(4)(i), (a)(4)(iii), (a)(7) or (b)****, with RF instantaneous input bandwidth greater than 400 MHz, and 4 bit or higher resolution whose output signal is a translation of the input signal (e.g., changes in magnitude, time, frequency) and specially designed parts and components therefor;*

While we may have missed some entries of concern in the proposal above, we believe a clarifying phrase like the one above is critical to clarify the entry is for electronic warfare and

does not control technology utilized in certain civil applications, such as civil automotive radar test equipment.

IV. Drafting or other technical issues in the text of Category XI(c)(10)

The USML provides the following language for Category XI(c)(10):

> *Antenna, and specially designed parts and components therefor, that:*
>
> *(i) Employ four or more elements, electronically steer angular beams, independently steer angular nulls, create angular nulls with a null depth greater than 20 dB, and achieve a beam switching speed faster than 50 milliseconds;*
>
> *(ii) Form adaptive null attenuation greater than 35 dB with convergence time less than one second;*
>
> *(iii) Detect signals across multiple RF bands with matched left hand and right hand spiral antenna elements for determination of signal polarization; or*
>
> *(iv) Determine signal angle of arrival less than two degrees (e.g., interferometer antenna);*

We believe commercial antennas for telecommunication applications could be captured under Category XI(c)(10)(i) in two to three years. We respectfully request DDTC to remove the control XI(c)(10) (i) from the ITAR as it unintentionally catches a wide variety of civil commercial commodities or that additional power levels are added to the existing text as proposed below.

> *Antenna, and specially designed parts and components, operating with a peak transmit power greater than or equal to 250 watts, therefor, that:*
>
> *(i) Employ four or more elements, electronically steer angular beams, independently steer angular nulls, create angular nulls with a null depth greater than 20 dB, and achieve a beam switching speed faster than 50 milliseconds;*
>
> *(ii) Form adaptive null attenuation greater than 35 dB with convergence time less than one second;*
>
> *(iii) Detect signals across multiple RF bands with matched left hand and right hand spiral antenna elements for determination of signal polarization; or*
>
> *(iv) Determine signal angle of arrival less than two degrees (e.g., interferometer antenna);*

Thank you once again for the opportunity to provide comments on this notice of proposed rulemaking.

Sincerely,

Ken Montgomery
Vice President, International Trade Regulation & Compliance

Communications & Power Industries

April 13, 2018

U.S. Department of State
Office of Defense Trade Controls Policy
2401 E. Street NW
Washington, D.C. 20037

Attn: Ms. Sarah Heidema, Acting Director of Policy

Subject: Request for Comments Regarding Review of USML Categories V, X, and XI
Ref: Docket # DOS-2017-017

Dear Ms. Heidema:

Communications & Power Industries LLC ("CPI") appreciates the opportunity to submit comments regarding the revisions to USML XI.

Overview of CPI

CPI is a global manufacturer of electronic components and subsystems focused primarily on communications and defense markets. With a heritage of technological excellence that spans decades, CPI develops, manufacturers and globally distributes innovative and reliable technology solutions used in the generation, amplification, transmission and reception of microwave signals for commercial and military applications. CPI serves customers in the communications, defense, medical, industrial and scientific markets. The subsystems and components manufactured by CPI include Vacuum Electron Devices (VEDs), solid state and VED-based high-power amplifiers, receiver protectors, transmitters, transceivers, integrated microwave assemblies, antenna systems and radomes. CPI's subsystems and components, when used in military applications, are used in or with the electronic warfare systems, communication systems and radar systems enumerated in XI.

Specially Designed

Overall, CPI has found the revisions to USML XI to be positive. Many of CPI's products that were controlled previously under USML XI have been reclassified as 3A611 under the EAR. However, due to the lack of guidance within the ITAR for applying "used in or with a defense article," military electronic components that are released from USML XI can be caught in a different USML category under a "specially designed" "catch-all" paragraph, based on where the USML XI end-item that contains the electronic component is *ultimately used.* Although "specially designed" establishes a criteria for "releasing" a part, component, attachment or accessory from the "specially designed" category, the "releases" are narrow and do not apply to a commodity that has a single use and when there is knowledge of where the commodity is ultimately used.

Due to the lack of guidance for "applying used in or with a defense article," coupled with the narrow releases, CPI is concerned about inconsistent classifications of the same product by industry and government.

607 Hansen Way Palo Alto, CA 94304 USA Phone: (650) 846-2900 Fax: (650) 846-3276
www.cpii.com

Consider the following scenarios that illustrate how a commodity can be caught and released from the ITAR based on where it is ultimately used:

1) **A VED that is designed for a category XI surveillance radar that is used with an Active Protection System (USML (VI)(f)(7)).** Following the order of review, a VED is first evaluated against XI(c)(9) based on its known use in a USML XI radar. A VED that does not meet or exceed the performance parameters of XI(c)(9) is not controlled in XI and is then evaluated against the remaining USML categories. USML VI(f)(7) controls shipborne Active Protection Systems and specially designed parts and components therefor.

   Paragraph (a)(1) of "specially designed" "catches a commodity when as a result of development has properties peculiarly responsible for meeting or achieving or exceeding the performance levels, characteristics, or functions described in the relevant USML category." The VED is not peculiarly responsible for achieving all of the characteristics or functions that describe the functions of an Active Protection System. Moreover, the radar that drove the performance of the VED only performs a portion of the characteristics and functions that describe an Active Protection System. The VED, therefore, is not caught as a result of paragraph (a)(1).

   Paragraph (a)(2) of "specially designed" "catches" a commodity, a part or component when it is *used in or with* a defense article. The VED is "caught" under VI(f)(7) as a "specially designed part or component" of an Active Protection Systems because the VED is used in a radar that is used in or with an Active Protection System. The VED remains "caught" under the ITAR because it cannot be "released" under paragraphs (b)(1) through (5) of "specially designed" as a result of its sole use and knowledge of where its ultimately used, even though the VED did not meet the minimum performance capabilities of XI(c)(9), the threshold for what is and isn't critical military technology.

   It should be noted that a VED that meets the XI(c)(9) performance parameters is subject to the ITAR and is as classified XI(c)(9), regardless of its design intent, i.e. military or commercial, or where it is ultimately used as a result of the Order of Review[1]. This guidance only applies when a commodity is "caught" in an enumerated category and a catch-all category. The Commodity Classification FAQ[2] further clarifies that a commodity that is not

---

[1] 22 CFR§121.(b)(2) "An item described in multiple entries should be categorized according to an enumerated entry rather than a specially designed catch-all paragraph."

[2] **https://www.pmddtc.state.gov/faqs/ecr.html#b Q: Is it possible for a defense article to be described in multiple entries on the U.S. Munitions List (USML)?**
A: Yes, the Order of Review process in ITAR §121.1(b)(1) allows for more than one category on the USML to apply to a defense article, and as such, you should review all potentially relevant USML entries. As a general rule, in cases where an item is described in multiple entries, an enumerated entry takes precedence over an entry controlling the item by virtue of a specially designed catch-all. The exception to this rule is where a SME entry is involved. In all situations, a SME entry will take precedence over a non-SME entry. Thus, a classified guidance system for a missile should be listed under Category IV(h)(30), which is SME, and not IV(h)(1).

If through the Order of Review, one determines a particular item itself is not specifically enumerated in the USML, it may still be controlled by virtue of its parts and components, which are caught via a catch-all. For example, a part or component of an airborne radar system specially designed for the F-35 may not be enumerated or captured in USML Category XI but controlled under the specially designed catch-all of Category VIII(h)(1).

enumerated in a USML category, which includes a commodity that does not meet or exceed the bright line performance capabilities of an enumerated category, may be "caught" in a catch-all category.

2) **A VED with identical frequency and output power as a VED in scenario one designed for use in a category XI ground-based surveillance radar**. A VED that does not meet or exceed the performance parameters of XI(c)(9) is not controlled in XI and is then reviewed against the remaining USML categories. The remaining USML categories do not control ground-based surveillance radars or VEDs, therefore the VED is released from the ITAR and controlled under the EAR as 3A611.x based on its use in the USML XI radar.

3) **A Solid State Power Amplifier (SSPA)[3] used in a surveillance radar that is used in or with an USML VI(f)(7) Active Protection System**. Following the order of review, an SSPA is evaluated against XI(c)(1) through (19). These paragraphs do not positively describe or control an SSPA based on its characteristics or functions, therefore it is not enumerated in XI. The SSPA, similar to scenario 1, is "caught" under VI(f)(7) based on its ultimate use.

4) **An SSPA with identical frequency and output power as the SSPA in scenario three designed for use in a ground-based surveillance radar**. The SSPA is released from the ITAR and is classified as 3A611.x because it is not enumerated in XI(c)(1) through XI(19) and is not enumerate in any other USML category.

Electronic components, such as antennas (USML XI(c)(10)), radomes (USML XI(c)(11)), receiver protectors, integrate microwave assemblies, etc…, may also be caught USML VII(g)(2), VIII(h)(1), XII(e)(1), XVIII(e), and XX(c) as result of where the USML XI end-item is ultimately used.

To rectify this issue CPI recommends the following changes.

1) DDTC should incorporate into "Specially Designed" guidance for applying *used in or with* as the mechanism for "catching" a part, component, accessory or attachment under paragraph (a)(2). Following the rationale provided in the FAQ[4] guidance for determining the

---

[3] An SSPA consisting of one or more substrates connected by cables or wires and mounted in an enclosure is not an MCM or PCB that is enumerated in XI(c)(2) and XI(c)(3), respectively.

[4] **http://pmddtc.state.gov/faqs/ecr.html#13 "Q: We manufacture application specific printed circuit boards (PCB) that are unique to each customer. Are all of these boards covered by the ITAR? How does 'specially designed' apply to such PCBs?**
A: The jurisdiction of a particular application-specific PCB is determined by the jurisdiction of the next higher-level functional assembly for which the PCB was specially designed (i.e., the jurisdiction of the item that drove the design requirements for the PCB in question). Thus, an application specific PCB whose layout is specially designed for a defense article controlled on the USML is controlled under ITAR Category XI(c)(2). Conversely, an application specific PCB whose layout is not specially designed for an article controlled on the USML would not be ITAR-controlled. For example, an application specific PCB whose layout is specially designed for an item controlled by 3A611.x would be controlled under the EAR in 3A611.g, even if the 3A611.x item is itself specially designed for a USML XI defense article. Stated another way, a PCB that is unique, specific, and directly related to the function and operation of the next higher level assembly (as opposed to the function and operation of the end item itself) would assume the same controls (i.e., jurisdiction) as those of the next higher assembly. Merely adding housing, connectors, wiring, or similar minor packaging to the PCB does not constitute the creation of a 'functional assembly.' For example, an application specific PCB whose layout is specially designed for a Category VIII(h)(17) mission computer specially designed for

jurisdiction and classification of a PCB, *used in or with* must be applied from the perspective of the next higher level USML end-item[5] that drove the design and performance capabilities[6] of the part, component, attachment and accessory.

For example, if the above recommended change were to be applied, the SSPA described in the scenario three and four above would not be caught under (a)(2) as a specially designed component of an Active Protection System (USML VI(f)(7)), because the Active Protection System is not the next level USML end-item that drove the performance requirements of the SSPA; the USML XI radar is the next level USML end-item that drove the performance requirements of the SSPA.

2) DDTC should add to paragraph (b) of specially designed a "release" when a part, component, attachment or accessory does not meet the measurable functions[7] or performance capabilities of an enumerated paragraph. Logically a commodity that is deemed not to be critical military technology based on its inability to meet or exceed the performance capabilities of an enumerated USML category should not be deemed critical military technology under any other USML category. For example a fire control radar antenna that is caught under XII(e)(1) as a specially designed component of a Fire Control System, should be released from "specially designed" and the ITAR when the antenna performance parameters do not meet or exceed the measurable performance capabilities of XI(c)(10).

Thank you for considering these comments and recommendations.

Respectfully submitted,

Creighton K Chin

Digitally signed by Creighton K Chin
DN: c=US, o=COMMUNICATIONS AND POWER INDUSTRIES, LLC, ou=COMMUNICATIONS AND POWER INDUSTRIES LLC, cn=Creighton K Chin, 0.9.2342.19200300.100.1.1=A0489FC0080113D45ED7BE00008E
Date: 2018.04.12 11:04:16 -07'00'

Creighton Chin
Export Compliance Manager
Communications & Power Industries LLC

---

the F-16 would be subject to the ITAR by virtue of its relationship to the computer and not because of its association with the aircraft itself. However, if the PCB were specially designed for a network interface module subject to the EAR that is specially designed for the same mission computer, then that PCB would not be subject to the jurisdiction of the ITAR because (i) the network interface module (the next higher-level assembly) is controlled under the EAR and (ii) USML category VIII(h)(17) does not contain a control of the mission computer's specially designed parts and components. In response to your second question, the application specific PCBs are, according to paragraph (a)(2) of the ITAR's and the EAR's definition of "specially designed," specially designed for the next higher order assembly as described above because they are 'for use in or with' that item or article. The paragraph (b) 'releases' of the ITAR's and the EAR's definitions of 'specially designed' are not applicable because the PCBs in your scenarios are application specific PCBs – they are unique to the next higher order item and were not designed for use in multiple applications. Of equal note, one should be advised that previously rendered commodity jurisdiction (CJ) determinations pertain only to those specific PCB layouts addressed in the original CJ requests and should not be extrapolated to other PCBs regardless of their similarity."

[5] 22 CFR§120.45(a)

[6] Note 1 to 22 CFR§ 120.4 (d) and Note 4 to 22 CFR§ 120.41(b)(3)

[7] Note 1 to paragraph 120.4 (d) and Note 4 to paragraph 120.41(b)(3)

Foster, John A

From: Diana Backstrom <diana.backstrom@creare.com>
Sent: Friday, April 13, 2018 10:46 AM
To: DDTCPublicComments
Cc: Chip Audette
Subject: Docket number DOS-2017-0017 - Request for Comments Regarding Review of USML Categories V, X and XI

Good morning,
Please find below a comment in response to Docket number **DOS-2017-0017, Request for Comments Regarding Review of USML Categories V, X and XI**.

Please let me know if you have questions or require additional information.
Best regards, Diana Backstrom

The current language of Category XI(a)(7) appears to capture all emerging technologies involving developmental electronics funded by DoD. We suggest adding a definition of the term "developmental" to clarify what the government intends to capture.

For example, many electronic prototypes are fabricated from commodity components that are wired together, either with or without a custom circuit board, to achieve a certain form or fit. The level of performance is unchanged. Does the DDTC intend for these basic electronics to be considered "developmental" simply because of the custom form or fit?

We recommend providing a definition of "developmental electronics" to include a performance criteria so as to avoid capturing commodity-level performance and to stay true to the goals of protecting U.S. military and economic advantage. Using features of the definition for "specially designed", we recommend language such as:

> *"Developmental electronics" means electronic components, assemblies, or equipment that, as a result of "development", has properties peculiarly responsible for achieving or exceeding the performance levels, characteristics, or functions of electronic items that are or were in "production." Electronics are not considered "developmental" simply because of a change in "form" or "fit."*

Diana Backstrom
Export Control Administrator
Creare LLC
16 Great Hollow Road
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603-640-2408

ECHODYNE

2380 116TH AVE NE, BELLEVUE, WA 98004

April 13, 2018

U.S. Department of State
Bureau of Political-Military Affairs
Directorate of Defense Trade Controls
Via email: DDTCPublicComments@state.gov

Attn: Richard Koelling, Acting Director, Office of Defense Trade Controls Policy

Re: Docket No. DOS-2017-0017, Request for Comments Regarding Review of USML Category XI

Dear Mr. Koelling:

Echodyne Corp. appreciates the opportunity to comment on the radar provisions of Category XI of the US Munitions List.

Background

Echodyne is a Seattle-based startup that makes small, lightweight, low-power, electronically steerable radars. Our company was founded in 2014, after Category XI was last revised. We are part of a wave of innovation in sensor technology generally and radar technology specifically.

Our radars electronically steer a radar beam, but in a way that is very different from a traditional phased array radar. We use a new architecture that eliminates the need for phase shifters and transmit-receive modules at each antenna element. Our unique approach nets savings in cost, size, weight and power over traditional phased arrays. The tradeoff is that our radars do not achieve the high performance levels of a phased array. Because of these performance limitations, our radars are not suited for military functions. However, they are ideally suited for commercial functions, and we have designed our radars from the ground up for commercial markets such as automotive, collision avoidance for UAVs, and industrial security.

Since our radars have no military-specific functionality, they should be controlled under the EAR and not ITAR. However, several clauses in Category XI(a)(3) describe broad categories of radars without any performance parameters, and thus over-control commercial radars like ours. In particular, there are several clauses in XI(a)(3) that broadly describe beam-steering architectures. Prior to 2014, almost all beam steering radars were military phased array radars. However, now that there are beam-steering commercial radars, these clauses of Cat XI need to be revised to distinguish between military and commercial radars based on performance. This is consistent with the goal of Export Control Reform to establish a positive control list based on objective technical parameters.

In your request for comments, you asked about defense articles that have entered into normal commercial use since the most recent revision of Category XI. As stated above, our radars were developed after 2014, they were designed as commercial products without any DoD funding, and they are now in normal commercial use. Over 80% of our business to date has been with commercial customers. Furthermore, the military customers for our radar are not using it to perform military functions; they are looking for COTS level performance and price for non-tactical functions.

In our comments below, we will:

- Provide comments on specific USML entries that lack performance parameters and are the most likely to capture commercial radars;
- Provide information on the commercial use of our product; and
- Discuss the potential cost savings from shifting control of specific commercial items from USML to EAR.

Specific entries and commercial use

1. **Category XI(a)(3)(i)** – Airborne radar that maintains positional state of an object or objects of interest, other than weather phenomena, in a received radar signal through time.

This entry has no performance parameters, and thus controls any airborne tracking radar (other than weather radar), regardless of its performance.

For example, Echodyne has developed an airborne detect and avoid radar, called MESA-DAA, for small to medium-sized commercial UAVs. We designed MESA-DAA from scratch, without any DoD funding, as a commercial product. The radar's capabilities are sufficient to enable a small UAV to avoid collision with a Cessna, but not sufficient for military functions. **Over 95% of our MESA-DAA radars are being used by non-military customers**. However, MESA-DAA and other radars like it are arguably captured by XI(a)(3)(i).

This over-control of airborne tracking radars hampers the FAA's goal of safely integrating commercial UAVs into the national airspace. The FAA is seeking detect and avoid solutions that will allow commercial UAVs to safely fly beyond line of sight of the operator. MESA-DAA provides this capability and can greatly enhance aviation safety. Echodyne is working with the FAA, NASA, the FAA UAS Test Sites and many private commercial companies to validate the safety of beyond line of sight flight using MESA-DAA.

However, if XI(a)(3)(i) has no performance specifications, it will capture commercial detect and avoid radars including MESA-DAA. Many US commercial aviation companies are unwilling to use an ITAR-controlled item, even within the US, because they employ non-US persons and it would be extremely difficult and costly for the companies to comply with the deemed export rules. This will hinder the adoption of this key safety technology and frustrate the FAA's goal of integrating commercial UAVs into the national airspace.

To distinguish between commercial and military airborne radars, we recommend adding the following performance parameters to the existing language of XI(a)(3)(i):

- free space detection of a 1 square meter RCS target at a range greater than 5 nmi; and
- a field of view update rate greater (faster) than 1 Hz.

We believe these parameters are greater than future anticipated FAA requirements for detect and avoid radar for commercial UAVs, but still well below the performance levels needed for military functions.

2. **Category XI(a)(3)(ix) -** Air surveillance radar with multiple elevation beams, phase or amplitude monopulse estimation, or 3D height-finding.

This entry applies broadly to many phased array and phased array-like radars, regardless of performance.

Since 2014 when Category XI was last revised, there has been dramatic growth in the commercial market for security radars, including security from airborne objects such as UAVs. In the past, the only real commercial use for these air surveillance radars was in air traffic control, which is carved out of the USML under Note 3 to (a)(3). However, the explosion in the number of hobby drones and commercial drones flying in the sky has led to a corresponding growth in the market for drone detection systems.

Echodyne currently sells a surveillance radar called MESA-SSR that we designed to be part of commercial drone detection systems. **Over 70% of our MESA-SSR radars are being used by non-military customers**, and the military customers for the product are using it for general security and not for tactical purposes. The current version of our MESA-SSR surveillance radar is not captured by XI(a)(3)(ix). However, we expect that future versions of the product will include one or more of the elements in this entry.

We note that high-performance air surveillance radars are already captured by (a)(3)(vii), (a)(3)(viii) and (a)(3)(x). This clause (a)(3)(ix) serves only to capture lower-performance radars that do not meet any of the thresholds in (vii), (viii) or (x). These lower-performance radars address the huge need for commercial drone detection systems, and these radars would be more appropriately controlled under the EAR. We recommend that you distinguish between commercial and military air surveillance radars by adding the following performance parameters to the existing language of XI(a)(3)(ix):

- free space detection of a 1 square meter RCS target at a range greater than 7 nmi;
- peak transmit power greater than 250 watts; and
- a field of view update rate greater (faster) than 1 Hz.

3. **Category XI(a)(3)(xxii) -** Radar employing automatic target recognition (ATR) (i.e., recognition of target using structural features (e.g., tank versus car) of the target with system resolution better than (less than) 0.3 m).

In the next one to two years, Echodyne and other makers of automotive radars will introduce the next generation of automotive radars for autonomous driving. These automotive radars will have system resolution better than (less than) 0.3 m, and will employ object classification (e.g. distinguishing between a bicycle and a pedestrian).

We recommend a note be added to Category XI to exclude civil automotive radars, similar to the note in 6A008 of the EAR.

4. **Category XI(a)(3)(xxv) -** Radar that sends and receives communications.

We believe that in the next five years, there will be widespread commercial adoption of radars that send and receive communications. For example, automotive radars could also be used for vehicle to vehicle communications. The radars on cars might exchange data with each other about the objects they see,

thus increasing situational awareness and safety for both cars. The same may be true for air to air radars on aircraft.

We recommend deleting this entry, since communications is a generic, non-military function.

Cost savings

In your request for comments, you asked about the cost savings of shifting specific commercial items from USML to EAR. We estimate the direct cost savings for our company would be approximately $2,000,000 per year. This $2,000,000 figure represents the costs of:

- two full-time ITAR compliance employees;
- Outside counsel fees;
- filing fees;
- onsite computer servers, government cloud services and other fully ITAR-compliant IT systems;
- segregated work spaces; and
- a segregated workforce.

Shifting commercial items from USML to EAR results in time savings equal to three full-time employees. Additionally, it means products can often be shipped immediately when an order is received rather than waiting several months for approval of an export license.

The costs described above are substantial, but they don't even begin to capture the true cost of ITAR status, which is lost sales and the stifling of innovation. Many large commercial companies in the US simply refuse to purchase an ITAR product, even for use within the US, due to the difficulty of complying with the deemed export rules for an ITAR product. This hinders the development of new radar products and markets, and prevents commercial adoption of key safety technologies.

Conclusion

In conclusion, Category XI needs to be updated to reflect the introduction of new types of commercial radars since Category XI was last revised in 2014. Several clauses in Category XI(a)(3) describe broad categories of radars without any performance parameters, and thus over-control commercial radars. DDTC should distinguish between military and commercial radars by adding performance parameters to those clauses, and by excluding certain categories of radars such as automotive radars. This is consistent with the goal of Export Control Reform to establish a positive control list of military items based on objective technical parameters.

Best regards,

/s/ Andrea Radosevich

General Counsel
Echodyne Corp.

Foster, John A

From: Christie Pennington <CPennington@EssexInd.com>
Sent: Thursday, April 12, 2018 3:20 PM
To: DDTCPublicComments
Subject: "Request for Comments Regarding Review of USML Categories V, X and XI."

Hello,

Regarding ECCN: 9A620, Various Liquid Oxygen Converters manufactured by Essex Industries for aircrafts and medical uses are being captured in 9A620. The product line meets Equipment Specially designed to be installed in a vehicle for military ground marine, airborne and capable of operating while in motion an maintaining temperatures below F103K(-170C). See below

The converter is specified to operate in environmental temperatures (as installed) from -65°F ± 2°F to +260°F ± 2°F (291.5K to 400K). The contents of the converter, when in use, is Liquid Oxygen (LOX). The boiling temperature of LOX is -297.3°F (90.2K). Our converter "maintains" the temperature inside the container in a manner, as a double-walled, vacuum insulated Dewar, such that the LOX tends to boil at a much slower rate than if it were exposed to normal atmospheric conditions. Think of it as a very high-end Thermos bottle.

The technology used for liquid oxygen conversion is the same if it used on a ship, in a mobile medical hospital (used with in disaster situations), helicopter ambulance.

This is very old technology, Essex purchase this line from Linde in the early 1960's.

Why would the cryo tank for a military aircraft be 600 series with that same technology and a different configuration which serves a field hospital (patient oxygen).

It is still the first customer dictating the ECCN and our cryogenics product line itself. However, what would the ECCN be, is not 9A620?

Thank you!

Christie Pennington | Manager of Export Control and Compliance
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April 6, 2018

Rick Koelling
Acting Director
Office of Defense Trade Controls Policy
Bureau of Political-Military Affairs
U.S. Department of State
2401 E Street NW
Washington, D.C.

ATTN: Request for Comments Regarding Review of USML Categories V, X and XI
Public Notice 9980, Docket No. DOS-2017-0017, RIN 1400–AE46, 83 FR 5970

Dear Mr. Koelling:

Esterline Technologies Corporation supports the goals and objectives of the Export Control Reform (ECR) Initiative, and submits the following comments on the condition and efficacy of USML Categories V, X, and XI, particularly with respect to topics 4 and 6 in the subject Request for Comments:

> 4. Drafting or other technical issues in the text of all of the referenced categories.
>
> 6. Potential cost savings to private entities from shifting control of specific commercial items from USML to the Export Administration Regulations. To the extent possible, please quantify the cost of compliance with USML control of commercial items, to include the time saved, the reduction in paperwork, and any other cost savings for a particular change.

Summary of Comments and Recommendations

This section outlines our main comments, each of which is explained more fully in the remainder of this letter.

1. Allow public comment on the policy regarding specially designed components of USML Category XI items used in or with USML VIII(h)(1) aircraft.
2. Significant cost savings related to self-determination of jurisdiction and classification depends on having fewer “catch-all” controls in the USML.

3. Incorporation of the Commerce Control List (CCL) ECCN 3A611.y “universal .y list” concept into the USML would result in significant cost savings.

4. Clarify jurisdiction and classification of populated circuit card assemblies in USML XI(c)(2).

5. Provide a definition for “multichip module” in USML XI(c)(3).

6. Clarify how USML XI(c)(18) relates to specially designed parts, components, and accessories of TEMPEST systems.

7. Update the Missile Technology Control Regime Annex in 22 CFR 121.16 to eliminate discrepancies with changes made by ECR.

Comments and Recommendations

1. USML Category XI Items Used In or With USML VIII(h)(1) Aircraft

In 81 FR 83126 DDTC published an interpretation to the effect that the USML VIII(h)(1) catch-all reaches through USML XI entries that lack a catch-all:

> If, through the order of review, one determines a particular item is not specifically enumerated in the USML, it may still be controlled by virtue of its parts and components, which are caught via a catch-all. For example, a part or component of an airborne radar system specially designed for the F–35 may not be enumerated or captured in USML Category XI but will be controlled under the specially designed catch-all of Category VIII(h)(1).

This interpretation was surprising, as it appeared to differ from verbal comments made by U.S. Government policy leaders early in the Export Control Reform effort. As this interpretation first appeared in a final rule, Esterline suggests it would be appropriate to invite public comment on this interpretation.

As a practical matter, part and component manufacturers face an upside-down set of facts when classifying their items, rather than the top-down order of review in the ITAR and EAR. That is, the analysis begins with looking at the immediate item with which the part or component is used, and identifying its jurisdiction and classification. The higher level item is frequently produced by a different manufacturer. With the interpretation in 81 FR 83126, this process is repeated at multiple layers of assembly and may involve multiple manufacturers – so it is much more complicated than finding a higher level item with a known jurisdiction and classification.

2. Cost of self-determining Jurisdiction and Classification

The burden on manufacturers to self-determine jurisdiction and classification is high, even for commercial items. A relatively simple self-determination can easily take one (1)

hour for a single item. Esterline's experience shows that self-determination rarely takes less than an hour, but often takes longer.

A hypothetical mid-size corporation may have an inventory of 3 million sellable products, bill of material sub items, and technical documents. If only 5% of these items are to be classified, at one hour each, the self-determination burden is approximately 72 person-years. Self-determination requires technically competent staff on a professional pay scale, so the cost may range from $7-10 million, plus a lost opportunity cost as these staff are not available to support new products design.

A small company may have an inventory of 50,000 items. If only 5% are to be classified, the burden is over a person-year, which may amount to 10-20% of its technical staff.

For a given part or component the analysis tasks generally include:

- Gathering documentation related to the item
- Reviewing the documentation
- Deciding whether the item is enumerated in the USML or CCL based on its characteristics
- Deciding what documentation is contemporaneous with development
- Deciding whether the documentation shows evidence of design intent, and if so, what it is
- Identifying equivalent items that differ for fit purposes only
- Performing internal "where used" analysis for evidence of manufacturer's own applications for the item
- Checking sales history and customer documents for evidence of customer applications for the item, usually including multiple levels of design hierarchy and multiple supply chain tiers
- Find the potential "catch-alls" for the item in the USML and 600-series
- Performing a "catch and release" specially designed analysis, often three times for USML, 600-series, and CCL dual use.
- Documenting the analysis

If the number of catch-alls to check and the number of USML catch and release analyses to perform were reduced, the benefit could be on the order of 10 minutes per analysis. For the hypothetical mid-size corporation described above, the savings would be 12 person-years, or about $1.2-1.7 million. Additionally, a technical team of 12 in one year could design a new product worth millions of dollars in revenue.

Some points to consider:

- Self-determination applies to more than exports. Domestic supply chain activities must identify when a purchase order requires a supplier with a DDTC registration. Also, 22 CFR 122.5 requires recordkeeping for the manufacturing, acquisition, and disposition of defense articles even when they are produced and consumed in the United States. Finally, manufacturers must be able to tell whether foreign person employees require an export license for their employment.
- For part and component manufacturers, most self-determinations are for items that are not enumerated but may be specially designed or may be commercial.
- Most self-determinations are for older products designed long before Export Control Reform. Documents related to older products are often incomplete.
- Applications of the item by higher-level customers are often not readily available, and must be obtained through correspondence which requires additional effort.

3. Incorporation of CCL ECCN 3A611.y "universal .y list" concept into USML

Esterline suggests DDTC consider adopting the CCL ECCN 3A611.y "universal .y list" as items released from "specially designed" in the USML. Since ECCN 3A611 corresponds to USML Category XI, this concept is within the scope of this Notice of Inquiry.

As noted by BIS in 79 FR 37551, technical experts from the Department of Defense reviewed the commodities proposed for the universal .y list in ECCN 3A611.y. These items were found to be relatively unsophisticated and to not directly contribute to the military functions of a "600 series" commodity. Further, their pattern of usage was found not to provide valuable insights into military capabilities and activities of other nations. It is reasonable to assume these findings would remain valid with respect to catch-all controls in the USML.

A primary benefit of ECCN 3A611.y today is its effect on reducing classification burden. Once an item is found not to be in the USML, the classifier may presume the item is caught in a 600-series ECCN and then attempt to show a (b)(3) release. If the documentation is incomplete for a (b)(3) release, then 3A611.y is assigned and the classification is complete.

Such analyses still require assessing whether the item is controlled in the USML due to a specially designed catch-all. If 3A611.y items were excluded from USML catch-alls by definition, the classification burden for 3A611.y items would be cut at least in half.

4. Populated Circuit Card Assemblies (CCAs)

Classification of populated CCAs is confusing because XI(c)(2) only controls these items based on layout, but populated CCAs may be specially designed for reasons other than the layout of the Printed Circuit Boards (PCBs).

USML XI(c)(2) should be revised to clarify the jurisdiction and classification of populated CCAs when the reason they are specially designed is the particular selection of components mounted to the PCBs, or the firmware loaded into programmable microcircuits mounted on the PCBs, or the conformal coating applied to the finished populated CCAs; as opposed to having a specially designed layout the PCBs.

Additionally, it would be helpful if USML XI(c)(2) included a note explaining the meaning of 'layout' because the fabrication files for PCBs generally include information that would normally not be considered 'layout.' For example, the pattern of metal planes and traces per layer and the schedule of plated through holes would always be considered 'layout.' Location and diameter for unplated mounting holes (being features for fit purposes) would probably not be considered 'layout.' It is reasonable to exclude the silk screen from 'layout' because equivalent items have different part numbers marked on them, and the silk screen is nonfunctional. Solder mask is functional and might be considered 'layout'.

5. Multichip Modules

USML XI(c)(3) should be revised to clarify the scope of items it controls, by (a) indicating which of several competing definitions for "multichip module" apply, and (b) stating how jurisdiction and classification of multichip modules apply when the reason they are specially designed is the particular selection of electronic components mounted to the module substrate, or the firmware loaded into programmable microcircuits mounted on the module substrate; as opposed to having a specially designed layout in the substrate.

Esterline suggests using the definition for "multichip module" in MIL-PRF-38534, since it is published by the Department of Defense and is publicly available:

> A hybrid microcircuit that contains two or more microcircuits, each having greater than 100,000 junctions.

Other definitions for multichip module are provided in copyrighted industry standards such as JEDEC JESD88F, IPC-T-50, or IEC 60194. Criteria range from simply having a minimum of two microcircuits to having closely spaced microcircuits with a minimum packing density.

6. Specially designed parts, components, and accessories of TEMPEST systems

USML XI(c)(18) should be revised to clearly indicate the scope of parts, components, and accessories it controls.

Currently, USML XI(c)(18) controls

> Parts, components, or accessories specially designed for an information assurance/information security system or radio controlled in this subchapter that modify its published properties (e.g., frequency range, algorithms, waveforms, CODECs, or modulation/demodulation schemes)

The control parameter “modify its published properties” does not appear to control specially designed items that are peculiarly responsible for a relevant end item achieving its published properties when those properties are not modified. Further, by providing an illustrative list of properties, it is difficult to appreciate which properties are relevant.

For example, if a component is specially designed for use in or with a TEMPEST system in USML XI(c)(5)(iv), and was designed to meet the original TEMPEST requirements, then the published properties of the TEMPEST system were never modified. Reading USML XI(c)(18) literally, the component would not be controlled in USML XI(c)(18) simply because the system’s published properties were per original design requirements and not modified.

7. Discrepancies between 22 CFR 121.16 MTCR Annex and ECR

The MTCR Annex in 22 CFR 121.16 should be brought up to date with the current MTCR, and items no longer subject to the ITAR should be removed; or alternately, the text “The following items constitute all items on the Missile Technology Control Regime Annex which are covered by the U.S. Munitions List” should be deleted.

22 CFR 121.16 is many years out of date with respect to the multilateral export control regime. It is also out of date with respect to USML changes under ECR. As a result, it contains a number of incorrect statements with respect to the USML, including USML Categories V and XI.

Two examples of incorrect statements in 22 CFR 121.16:

- 22 CFR 121.16 Item 4—Category II (a)(4) incorrectly states that the USML covers

  > “Sphercical [sic] aluminum powder with particle of uniform diameter of less than 500×10^{-6}M (500 microns) and an aluminum content of 97 percent or greater

  USML Category V no longer controls such aluminum powder unless it is nanosized (less than 200 nanometers in any direction), per USML V(c)(5). CCL ECCN 1C111.a.1 controls

  > Spherical or spheroidal aluminum powder (C.A.S. 7429-90-5) in particle size of less than 200 × 10−6 m (200 μm) and an aluminum content of 97% by weight or more, if at least 10 percent of the total weight is made up of particles of less than 63 μm, according to ISO 2591-1:1988 or national equivalents
  > Technical note: A particle size of 63 μm (ISO R-565) corresponds to 250 mesh (Tyler) or 230 mesh (ASTM standard E-11).

  ECCN 1C111.a.1 is consistent with the 2017 MTCR Annex, Category II; Item 4, heading 4.C.2.c.

- 22 CFR 121.16 Item 13—Category II (a)(4) incorrectly states that the USML covers

> analog computers, digital computers, or digital differential analyzers designed or modified for use in the systems in Item 1 (see §121.1, Category XI (a)(6), having either of the following characteristics: (a) Rated for continuous operation at temperature from below minus 45 degrees C to above plus 55 degrees C; or (b) Designed as ruggedized or "radiation hardened"

USML XI(a)(6), cited in 22 CFR 121.16, is now reserved. While USML XI(c)(16) does control

> hybrid (combined analogue/digital) computers specially designed for modeling, simulation, or design integration of systems enumerated in paragraphs (a)(1), (d)(1), (d)(2), (h)(1), (h)(2), (h)(4), (h)(8), and (h)(9) of USML Category IV or paragraphs (a)(5), (a)(6), or (a)(13) of USML Category VIII (MT if for rockets, SLVs, missiles, drones, or UAVs capable of delivering a payload of at least 500 kg to a range of at least 300 km or their subsystems. See note 2 to paragraph (a)(3)(xxix) of this category),

this is a different item. CCL ECCN 4A101 controls

> "Analog computers, "digital computers" or digital differential analyzers, other than those controlled by 4A001 designed or modified for use in "missiles", having any of the following ... a. Rated for continuous operation at temperatures from below 228 K (−45 °C) to above 328 K (+ 55 °C); or b. Designed as ruggedized or 'radiation hardened'. Note: 'Radiation hardened' means that the "part," "component" or equipment is designed or rated to withstand radiation levels which meet or exceed a total irradiation dose of 5×10^5 rads (Si).

ECCN 4A101 is consistent with the 2017 MTCR Annex, Category II; Item 13, heading 13.A.1.

Summary

Thank you for the opportunity to comment on the condition and efficacy of USML Categories V, X and XI. Please feel free to contact me if you have any questions about the comments and recommendations provided.

Regards,

Rich Baldwin
Director, Trade Compliance Technology
Esterline Technologies Corporation

FORTEM TECHNOLOGIES

Comments Regarding Review of USML Category XI
DOS–2017–0017

United States Department of State,

I am delighted that USML Category XI is being reviewed to ensure the 'positive list' is accounting for technological developments, practical application issues, and changes in the military and commercial use of items, and that the USML is not inadvertently controlling items in normal commercial use.

Over the years I have engaged with DDTC, DTSA, and all branches of the DoD, and have exported under both EAR and ITAR to countries around the world. I have an appreciation of the need to provide the US military with critical military and intelligence advantages. For several decades, from my graduate school work 20 years ago to the present day, I have been at the forefront of the development of miniaturized radar systems for aircraft with dual use in commercial and military applications. The radar systems I have developed with multiple companies are in use on manned and unmanned aircraft, both commercial and military. Such systems are now available in international markets and no longer provide the US with a critical military advantage that warrant a USML designation and could be handled under EAR.

Of relevance to USML Category XI, I have seen several aspects of radar enter into normal commercial use, and forsea significant increases in commercial applications use in the next 5 years. I am working closely with the FAA, FCC, NASA, and numerous private commercial entities in the rapidly evolving market of autonomous flight. Aircraft safety is being improved with the addition of commercial radar system for wire detection, terrain avoidance, and collision avoidance.

For autonomous air vehicles to fly in the national airspace, they must meet the FAA requirement (CFR 91.113) to 'see and avoid other aircraft' and maintain 'well clear', giving right of way to balloons, gliders, powered parachutes, airships. Because small drones and many other forms of air vehicles are not required to use transponders, an active means of monitoring the airspace is necessary. Radar is being employed both on the autonomous vehicles and on the ground as a means of detecting and tracking other aircraft and objects so that collisions are avoided and safe separation or 'well clear' can be ensured. For purposes of this paper, airborne radars are referred to as 'detect and avoid' (DAA) radars, and ground based radars as 'ground based detect and avoid' (GBDAA).

To be effective, these air safety radar systems, either in the air (DAA) and on the ground (GBDAA), must employee technologies currently controlled under Category XI:

- Maintain positional state of objects through time, typically through the use of a tracker (3)(i)
- Use multiple beams or monopulse or other mechanisms to determine 3D-height (3)(ix)
- Electronically steer in elevation and azimuth (3)(xii)
- Distinguish between various objects in the air to classify birds, helicopters, manned aircraft, drones etc. via non-cooperative target recognition (3)(xxii)
- Use numerous elements to electronically steer beams and null interference over 20dB quickly (10)(i)
- Adaptively null attenuation in excess of 35dB faster that 1 second. (10)(ii)
- Locate a target with an angle accuracy better than 2 degrees. (10)(iv)

Radar systems employing these technologies have entered into commercial use;

- The Gryphon R1400 radar is a 3-D Active Electronically Scanned Array (AESA) that provides rapid, precise detection and tracking of airborne targets including small unmanned aircraft systems (UAS), general aviation, birds, and other cooperative or non-cooperative targets of interest. It contains built in target tracking and classification. Applications include UAS Traffic Management (UTM), product deliveries, airspace deconfliction, and airport security. http://gryphonsensors.com/products/#radar

- The Elta ELM-2026B is a 3D electronically scanned pulse-doppler GBDAA radar with multi-beam elevation coverage for detecting targets such as low flying low velocity UAVs. It performs track while scan and has an angular accuracy of less than 1 degree. The product origin is Israel.
- EchoDyne's MESA-DAA is used for mounting on UAVs to perform detect and avoid (DAA). It can scan in elevation and azimuth, perform 3D height location, track targets, has high angular accuracy on the order of 1 degree, and can null interference.
  https://echodyne.com/wp-content/uploads/2017/08/MESA-DAA_Product_Sheet.pdf
- Dynetics GroundAware GA9000 GBDAA radar electronically scans using multiple simultaneous beams. It is a 3D sensor capable of deep nulling and tracking and classification of low-altitude airspace targets.
  https://www.dynetics.com/groundaware/
- Fortem Technologies TrueView R20 and R30 model radars are respectively designed for DAA and GBDAA.. They perform 3D height finding, electronic scanning in one or two dimensions with beam nulling and angular accuracies that can be better than 2 degree. They optionally include trackers and classifiers.
  https://fortemtech.com/fortem-trueview-radar/

Cost savings possible by shifting to EAR are significant. Currently, to ship a single Fortem TrueView R20 internationally and support them in their integration with a TAA, the cost of filing the DDTC paperwork for a single unit is estimated at $3000 for a product that sells for $12,000 (TrueView R20 retail price). While there is significant international interest, a 25% hit off the retail price for regulatory matters makes selling internationally unviable. This prevents international customers from evaluating the product and incorporating it into their air safety systems and makes American made products uncompetitive and international customers are sourcing from more export friendly nations..

Specific recommendations for change;

- Option A) Similar to the note in EAR 6A008 excluding civil automotive radar and secondary surveillance radar, additionally exclude,
  a. civil aircraft detect and avoid (DAA) radar,
  b. Ground radar equipment "specially designed" for air safety monitoring (GBDAA) with a maximum "instrumented range" of 20 km or less;
- Option B) Similar to the note to Category XI c)(10) that excludes TCAS equipment from the USML, a blanket exclusion to Category XI for ground and air based Detect and Avoid radar should be added. Because the FAA is still years from publishing a TSO for small radar systems such as Fortem TrueView R20, references to a specific TSO should be left out of the exclusion. If further narrowing is required, constrain the instrumented range to 20km.

Thank you for considering these comments,

Regards,

Adam Robertson
CTO, Fortem Technologies Inc

Wednesday, April 11, 2018

BY ELECTRONIC MAIL
DDTCPublicComments@state.gov

General Atomics Aeronautical Systems, Inc.
3000 K Street NW, Suite 250
Washington, DC 20007

SUBJECT
DOS-2017-0017 "Request for Comments Regarding Review of USML Categories V, X, and XI"

Forward:

This request for comment is a part of ongoing efforts to revise the USML to create a "positive list" that describes controlled items using objective criteria rather than broad, open-ended, subjective, catch-all, or design intent-based criteria. As discussed in the notice of Inquiry, key objectives of the USML are to maintain "control over those defense articles that provide a critical military or intelligence advantage, or otherwise warrant control under the International Traffic in Arms Regulations (ITAR), without inadvertently controlling items in normal commercial use."

Purpose:

The letter provides the responses developed by General Atomics - Aeronautical Systems Inc. (GA-ASI) for proposed modifications the USML Category XI: Military Electronics. Our response primarily applies to the request for comment on defense articles for which commercial use is proposed, intended or anticipated in the next 5 years.

Background:

For manned aircraft, the pilot provides the ability to visually observe the area surrounding the aircraft flight path to identify and respond to any potential concerns such as a near mid-air collision. This is especially important in airspace where visual flight rules apply. This capability that is assumed by the presence of a pilot is known as "see and avoid." In order to mimic this capability, unmanned aircraft need to have an alternate means to identify and respond to these potential concerns. This is referred to as "detect and avoid."

On May 31, 2017 RTCA released DO-365 "Minimum Operational Performance Standards (MOPS) for Detect and Avoid (DAA) Systems" and DO-366 "Minimum Operational Performance Standards (MOPS) for Air-to-Air Radar for Traffic Surveillance." These document are a set of standards prepared by RTCA Special Subcommittee 228 (SC-228) to establish a baseline from which a path to integration of Unmanned Aircraft Systems (UAS) into the National Airspace System (NAS) can be established.

One method of detection available to unmanned aircraft is the use of existing electronic traffic systems such as ADS-B Transponders and TCAS II. For aircraft not equipped with these systems, a radar is needed. DO-366 provides the minimum standard in order for an onboard radar to establish tracks of airborne traffic with sufficient range and accuracy to support a UAS ability to remain well clear of other traffic and avoid collisions.

In September 2017 the FAA adopted the standards defined by DO-366 in the release of Technical Standard Order (TSO) C212 Air-to-Air Radar (ATAR) for Traffic Surveillance. The release of TSO-C212 establishes RTCA DO-366 as the minimum required standards for an airborne radar that would support civil and commercial applications of UAS in the NAS.

Proposed changes to the United States Munitions List (USML)

Airborne Radar

Per the current version of the USML (22 CFR Part 121), a radar designed to meet the DO-366 MOPS would be designated as a defense article as defined by USML Category XI paragraph (a)(3)(i):

> (i) Airborne radar that maintains positional state of an object or objects of interest, other than weather phenomena, in a received radar signal through time;

In order to allow for the commercialization of airborne radars developed to DO-366 GA-ASI recommends the Department of State to revise USML Category XI paragraph (a)(3)(i) to the following:

> (i) Airborne radar that maintains positional state of an object or objects of interest, other than weather phenomena or for traffic awareness, in a received radar signal through time with a detection range of a 1 square meter RCS target greater than 15 nmi;

Electronic Steering Radar

Paragraph (a)(3)(xii) of the USML currently states:

> (xii) Radar incorporating pulsed operation with electronics steering of transmit beam in elevation and azimuth;
>
> Note to paragraph (a)(3)(xii): This paragraph does not control radars not otherwise controlled in this subchapter, operating with a peak transmit power less than or equal to 250 watts, and employing a design determined to be subject to the EAR via a commodity jurisdiction determination (see §120.4 of this subchapter).

As written, it is unclear whether this designation applies to passive electronically scanned array (PESA) radars that use a single transmit receive module or active electronically scanned array (AESA) radars that use multiple lesser powered transmit received element modules. GA-ASI recommends expanding on the note to specifically address a peak transmit power for individual AESA modules. The recommended power and frequency are for an AESA radar that can meet the DO-366 minimum performance standards:

> (xii) Radar incorporating pulsed operation with electronics steering of transmit beam in elevation and azimuth;
>
> Note to paragraph (a)(3)(xii): This paragraph does not control radars not otherwise controlled in this subchapter, for PESA radars operating with a peak transmit power less than or equal to 250 watts, for AESA radars operating with a peak transmit power less than or equal to 5 watts per transmit module for frequencies greater than 8 Ghz, and employing a design determined to be subject to the EAR via a commodity jurisdiction determination (see §120.4 of this subchapter).

Conclusion

GA-ASI technical experts believe that the proposed language sufficiently protects radar technology critical to national security, while allowing the commercial UAS industry to meet FAA standards and safety requirements. Thank you for your consideration and please let me know if you need any

additional information. My point of contact for the subject request is Steve Casazza, who can be reached at 202-494-6887 or via email at steven.casazza@ga-asi.com.

Sincerely,

Nicola "Niki" Johnson

Senior Director, Government Affairs
General Atomics - Aeronautical Systems
nicola.johnson@ga-asi.com
(202) 870-7085

9, **Name:** Anonymous Anonymous

General Comment

Regarding USML Category XI (a)(5); the systems caught here - Command, control, and communications (C3); command, control, communications, and computers (C4); command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) should be defined terms or there should be a better explanation of what is meant to be caught here.

10. **Name:** Anonymous Anonymous

General Comment

Regarding USML Category XI (a)(5)(i); integrate, incorporate, network, or employ - should be defined terms or there should be a better explanation of what is meant to be caught here.

11. **Name:** Mark Prouty
Address:

2190 Fortune Drive
San Jose, CA, 95131
Email: markp@geometrics.com
Phone: 408-428-4212

General Comment

RE: Docket Number DOS-2017-0017

This is in response to the request for public comments on Category XI of the USML. Specifically, Geometrics is commenting on the following definition of the USML:

a(9)Electronic sensor systems or equipment for non-acoustic anti-submarine warfare (ASW) or mine warfare(e.g. magnetic anomaly detectors (MAD), electric-field, electromagnetic induction);

This wording is vague and potentially quite broad and has caused confusion over whether it encompasses sensor systems commonly used in geophysics. Magnetometer and electromagnetic induction equipment commonly used in geophysics are also sensitive to submarines and other military objectives. It is not the sensor but the use made of it that would distinguish a military system from a geophysical system.

The Commerce Control List defines specific performance characteristics of more tightly controlled

classifications from ones less tightly controlled, based upon the suitability of sensors to be used in military applications. We would point out that magnetic and electromagnetic sensors are dual-use, as they are quite common geophysical methods, and we would suggest that therefore they are appropriately controlled by Commerce, and this definition should be removed entirely from the USML.

Absent that, the USML should define what differentiates a sensor or sensing system for ASW or mine warfare form those used in geophysics. At a minimum, something like "specially designed for" would at least acknowledge that the CCL covers very similar territory and that some differentiating feature exists, even if hard to define. However, this is also very vague and is likely to lead to confusion. Better would be to actually define what those differentiating features are, if such features exist.

Geometrics feeling is that there really are no differentiating features between magnetometers used in military application and ones used in geophysics. They both make a measurement of the magnetic field. The only way to differentiate among them is to give limits for various performance specifications (as the CCL does). If such features can be determined and specified, this would allow for differentiation between military and non-military items.

The cost to Geometrics and the Government of the current definition has been considerable. Geometrics applied for a CJ for one of our products in February of 2016 (CJ-0256-16). We received a ruling of Category XI a(9) in February of 2017. We appealed, and receive a determination of ECCN 6A006.a.2 in March of 2018. This means the government struggled for two years to determine how to apply the category XI definitions. For those two years, Geometrics and its customers had to follow ITAR regulations on this product, costing time, money, and lost sales.

Geometrics would like to thank the Government for its consideration of this matter, for the diligence of its struggle to apply the existing category XI definition to our CJ, and for the opportunity to make comments on this matter.

12. **Name:** Casey Duggan
Submitter's Representative: Casey Duggan
Organization: Small UAV Coalition

General Comment

See attached file.

Attachments

FINAL Small UAV Coalition Comments - Category XI.a.3

13. **Name:** Kirsten Shumway

General Comment

See attached file(s). The Boeing Company's comments in response to this Notice of Inquiry attached.

Attachments

Request for Comments Regarding Review of USML Categories V X and XI Docket No DOS-2017-0017

14. **Name:** Anita Zawacki
Address:

435 Devon Park Drive
Building 600
Wayne, PA, 19807
Email: zawacac@jmusa.com
Phone: 610-971-3089

General Comment

In response to the State Department's Notice of Inquiry on the review of USML Categories V, X and XI, attached are Johnson Matthey Inc.s comments on USML Category V(f)(4)(xv).

Attachments

Johnson Matthey Inc. NOI Comments on USML Category V(f)(4)(xv) (Docket Number DOS-2017-0017)

15. **Name:** Joseph Pasetti
Organization: Semiconductor Industry Association

General Comment

See attached file(s)

Attachments

USML XI SIA Comments Apr 13 18

16. **Name:** Anonymous Anonymous

General Comment

Thank you for the opportunity to provide comments. Please see attached file.

Attachments

Comments_CatXI

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April 13, 2018

By Electronic Mail (DDTCPublicComments@state.gov)

Richard Koelling
Acting Director, Office of Defense Trade Controls Policy
Directorate of Defense Trade Controls
U.S. Department of State
PM/DDTC, SA-1, 12th Floor
2401 E Street, NW
Washington, D.C. 20522

RE: RIN 1400–AE46 [Public Notice: 9980]: Notice of Inquiry; Request for Comments Regarding Review of United States Munitions List Categories V, X, and XI

Dear Mr. Koelling:

On behalf of one of its clients, Hogan Lovells US LLP ("Hogan Lovells") submits this letter in response to the February 12, 2018 notice published by the U.S. Department of State, Directorate of Defense Trade Controls ("DDTC") requesting comments regarding review of United States Munitions List ("USML") Categories V, X, and XI of the International Traffic in Arms Regulations ("ITAR").[1] We appreciate this opportunity to comment and respectfully request that DDTC consider:

a) Narrowing the scope of USML Category XI(a)(3)(iii) to cover Inverse Synthetic Aperture Radar ("ISAR") only when such systems are specially designed for military and intelligence applications so that this USML entry does not unnecessarily control systems with commercial and dual-use applications that should be subject to Commerce Department jurisdiction under the Export Administration Regulations ("EAR") and controlled under Export Control Classification Number ("ECCN") 6A008.d; and

b) Narrowing the scope of USML Category XI(a)(3)(xii) to cover radar incorporating pulsed operation with electronics steering only when such systems are specially designed for use with articles controlled under Categories VI, VII, and VIII so that this entry does not control systems with commercial and dual-use satellite applications.

I. Background Information

a) ISAR Control Background

Pursuant to the State Department's July 1, 2014 amendment to the ITAR, ISAR was added to USML Category XI as a specifically enumerated type of radar system under sub-paragraph (a)(3).[2] Prior to that amendment, ISAR was not specifically identified on the USML and instead had been

[1] Notice of Inquiry; Request for Comments Regarding Review of United States Munitions List Categories V, X, and XI, 83 Fed. Reg. 5970 (Feb. 12, 2018).
[2] Amendment to the International Traffic in Arms Regulations: United States Munitions List Category XI (Military Electronics), and Other Changes, 79 Fed. Reg. 37535 (July 1, 2014).

enumerated since at least 1996 only under ECCN 6A008.d of the EAR's Commerce Control List ("CCL"). Although the July 1, 2014 amendment made ECCN 6A008.d and USML Category XI(a)(3)(iii) coextensive with respect to ISAR systems, DDTC explained in its July 1, 2014 Federal Register notice that the newly enumerated radar systems under USML Category XI(a)(3), including ISAR, have always been controlled by the ITAR. In any case, the USML has included this entry explicitly covering all ISAR systems since July 1, 2014, which in turn means that no ISAR systems are controlled under the EAR, based on the order of review for determining export control jurisdiction and classification.

b) Electronically Steerable Antennae Background

Radar incorporating pulsed operation with certain electronically steerable antennae, controlled under USML Category XI(a)(3)(xii), can be used on surface vessels, ground vehicles, and aircraft for a variety of applications, including military and intelligence use. These steering capabilities often include adjustments well above one or two degrees for dynamic sensing. For certain commercial and dual-use satellites utilized in earth mapping and other applications, in contrast, electronically steerable antennae may only require antennae steerable in one to six degrees for calibration purposes. However, as written, Category XI(a)(3)(xii) currently captures all such systems, even those with more limited performance capabilities that may be useful predominantly for commercial and dual-use applications.

II. Amendment Request

a) Amendment to ISAR Controls Under USML Category XI(a)(3)(iii)

As part of Export Control Reform ("ECR"), the State and Commerce Departments seek to establish "bright line" rules between USML and CCL controls and the State Department maintains a policy to avoid inadvertently controlling items on the ITAR that are in normal commercial use, unless such items provide the United States with a critical military or intelligence advantage.

With respect to ISAR, instead of creating a clear demarcation between CCL and USML controls, USML Category XI(a)(3)(iii) appears to cover any and every item that would also meet the classification of ECCN 6A008.d, including systems that are not specially designed for military or intelligence applications and could be used in commercial and dual-use application. This effectively supplants ECCN 6A008.d with ITAR control entirely and appears to undermine the stated goals of ECR and the State Department's policy to avoid unnecessary controls on commercial and dual-use items. Moreover, as demonstrated in public comments to the State Department's 2013/2014 rulemaking on Category XI,[3] because some in the aerospace industry had understood for decades that at least some ISAR systems were intended to be controlled under ECCN 6A008.d, the enumeration of ISAR on both the USML and the CCL since 2014 has created confusion among the regulated industry.

While ISAR does have military and intelligence applications that require ITAR control, we understand that it also has a number of other applications beyond use in defense and intelligence. For instance, ISAR can be used on a satellite for scientific research purposes, including monitoring the movements of asteroids. Moreover, we understand that configurations of synthetic aperture radar

[3] DDTC, *Public Comments Regarding Revision of USML Category XI RIN (1400-AD25) and Supporting Documentation* (January 2013) (proposed rule originally published at 77 Fed. Reg. 70,958 (Nov. 28, 2012)), https://www.pmddtc.state.gov/regulations_laws/documents/proposed_rules/CategoryXI_Comments.pdf.

("SAR") can technically be employed for ISAR use, meaning that Category XI(a)(3)(iii) could be interpreted to cover any such SAR as well. SAR, including when capable of use as ISAR, can be utilized commercially in satellites for a variety of civil applications, such as monitoring crop health in agriculture, environmental assessment, and tracking forest fires.[4] Additionally, if SAR or ISAR systems were to be specially designed for military or intelligence usage, we understand that they would likely include anti-jamming capabilities, which is often not the case with the examples above. As a result, we submit that current USML Category XI(a)(3)(iii) is overly inclusive of commercial and dual-use items that do not warrant ITAR control.

Furthermore, Category XV already controls both ISAR and SAR for use with spacecraft (*see* Category XV(a)(8)). Category XI's entry of ISAR, which also could be interpreted to capture SAR systems that can be used as ISAR, therefore adds an overlapping entry controlling items carefully enumerated under Category XV. This further creates confusion over the proper classification of these items.

To remedy the confusion and over-control of the current USML entries, we respectfully propose that USML Category XI(a)(3)(iii) be amended in one of the following two ways:

- To apply only to "ISAR specially designed for military and intelligence applications,"
- To apply only to "ISAR specially designed for articles controlled under Categories VI, VII, and VIII," which would clarify that the ISAR controlled under Category XI does not relate to spacecraft, but only to surface vessels, ground vehicles, and aircraft.

Adding the "specially designed" formulation would narrow the scope of the Category so that it draws a clear line between the USML and CCL with respect to ISAR and avoids the unnecessary control by the ITAR of certain items with commercial or dual-use applications. It would additionally eliminate overlap on certain radar controls between Categories XI and XV.

b) Amendment to Electronically Steerable Antennae Controls Under USML Category XI(a)(3)(xii)

Electronically steerable antennae on satellites that may be currently controlled under Category XI(a)(3)(xii) are often used for commercial applications, rather than military and intelligence. Satellites may exclusively make use of electronics steering for minor calibration, of between one and six degrees, after entry into orbit and occasionally to ensure appropriate positioning for earth mapping. We respectfully submit that such items capable only of such limited commercial or dual-use applications do not warrant ITAR control and that their inclusion on the USML is inconsistent with the goal of ECR to avoid unnecessary controls on commercial items.

As a result, we respectfully suggest that DDTC consider amending Category XI(a)(3)(xii) to apply only to radar incorporating pulsed operation with electronics steering of transmit beam in elevation and azimuth specially designed for use with articles controlled under Categories VI, VII, and VIII to eliminate from the Category these systems that may have commercial and dual-use applications.

---

[4] *See, e.g.*, Jiali Shang *et. al.*, *Application of Multi-Frequency Synthetic Aperture Radar (SAR) in Crop Classification*, Chapter 27, IN TECH (Oct. 1, 2009), https://www.intechopen.com/books/advances-in-geoscience-and-remote-sensing/application-of-multi-frequency-synthetic-aperture-radar-sar-in-crop-classification.

* * *

Thank you for your consideration of these comments.

Respectfully submitted,

Stephen Propst
Anne Fisher
Sean Carlesimo

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202-662-2650

April 13, 2016

Department of State
Bureau of Political-Military Affairs
Department of Defense Trade Controls
2401 E Street, N.W.
12th Floor, SA-1
Washington, D.C. 20522

ATTN: Mr. Richard Koelling, Acting Director, Defense Trade Controls Policy

SUBJECT: Honeywell Response to Proposed USML Category XI Changes

Reference: Federal Register Vol. 83, No. 29 published February 12, 2018 - Docket No. DOS-2017-0017 Request for Comments Regarding Review of USML Categories V, X, and XI (RIN 1400-AE46)

Dear Mr. Koelling:

Honeywell International Inc. provides the following comments with regard to the proposed changes to ITAR Category XI.

Specific concerns regarding the proposed rule and requests for clarification are identified below:

On May 31st, 2017 RTCA released DO-365 "Minimum Operational Performance Standards (MOPS) for Detect and Avoid (DAA Systems) and DO-366 "Minimum Operational Performance Standards (MOPS) for Air to Air Radar for Traffic Surveillance" for the purpose of providing safe operation of UAV / UAS systems in the United States National Airspace by providing collision avoidance with aircraft not carrying TCAS, ADS-B or other commercial Traffic Collision avoidance systems. These "Non-Cooperative" Aircraft pose a threat to safety of commercial, military, local or regional governments operating UAS for lawful purposes. The DO-365 and DO-366 standards establish radar performance requirements that must be achieved to provide well clear operation of licensed UAS and non-cooperative aircraft.

Honeywell References the following existing Category XI Paragraphs for consideration of possible changes that would prevent capturing these Sense and Avoid or Detect and Avoid Radar systems under USML paragraphs.
It is also our concern that commercial airborne weather radars are desired by Aircraft OEM to be used to dramatically improve commercial and business aircraft landing accuracy and safety during GNSS denial of service or degraded visual conditions. These radars may employ methods of tracking specific ground features using electronic beam steering in order to determine runway alignment and the potential detection of other aircraft, vehicles or other objects that may pose a threat during approach or landing on an assigned runway.

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Currently Category XI, Paragraph 3(i) Reads:

*(3) Radar systems and equipment, as follows:

(i) Airborne radar that maintains positional state of an object or objects of interest, other than weather phenomena, in a received radar signal through time;

Proposed Changes would read:

(3) Radar systems and equipment, as follows:

(i) Airborne radar that maintains positional state of an object or objects of interest, other than: weather phenomena; airborne traffic surveillance for the purpose of collision avoidance; or non-military aircraft landing aids for the purpose of landing accuracy and collision avoidance, in a received radar signal through time.

We also wish to be sure that latest technology commercial weather radars as well as Detect and Avoid Radars are not caught in Category XI (3) (xii) when they are FMCW radars operating with a continuous transmit power under 40Watts in *any Weather radar band or Detect and Avoid Authorized radar band currently listed by the FAA and FCC or found in the DO 365 / DO 366 documents*. While the current language of XI (a)(3)(xii) does not appear to capture an FMCW radar and refers only to "pulsed operation with electronics steering..." we are concerned that the average power of the stipulated 250W peak radar power may be construed to limit average or continuous power of the radar to levels of 25 Watts or less. As an example, as written the paragraph may potentially capture a 30W FMCW radar if it were construed to be equivalent to a 300W peak radar with a 10% duty cycle and a resulting average power of 30W.

We are also aware that commercial weather radars or Detect and Avoid radars may be made with either Passive or Active Elements for the purpose of achieving Transmit Electronic Beam Steering. As currently written a radar employing 250 Watts or less of transmitter power input to a Transmit array steered with passive electronic steering means would be excluded from Paragraph XI (a) (3) (xii) but we wish to be clear that transmit arrays that employ an array of active transmit modules that locally generate transmit power at each antenna element, whose *summed total peak power of all active array modules is less than or equal 250Watts peak or 40W average* should also be excluded from this paragraph. We do not support a specification listing the peak or average power of a single active transmit module because a large number of active modules may allow substantially greater than 250W of transmit power. For example allowing *any number* of active transmit modules with 5W or less of Peak or Continuous power could allow 500 watts of transmit power if 100 modules are employed.

The current XI (3) (xii) reads:

(xii) Radar incorporating pulsed operation with electronics steering of transmit beam in elevation and azimuth;

NOTE TO PARAGRAPH (a)(3)(xii): This paragraph does not control radars not otherwise controlled in this subchapter, operating with a peak transmit power less than or equal to 250 watts, and employing a design determined to be subject to the EAR via a commodity jurisdiction determination (*see* §120.4 of this subchapter).

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We propose the following changes to allow the use of commercial transport weather radars and Detect and Avoid Collision avoidance radars, whose purpose is safety of life or protection of valuable UAS assets:

(xii) Radar incorporating pulsed or CW operation with electronic transmit beam steering in both azimuth and elevation;
Note to Paragraph (a)(3) (xii): This paragraph does not control radars otherwise controlled in this subchapter, operating with a peak transmit power of less than 250 or average of less than 40W when applied as the input to a passive electronically steered array; Nor does it apply to active electronically steered transmit beams when the sum total peak power of all active transmit modules does not exceed 250W peak or 40W Continuous or Average and employing a design determined to be subject to the EAR via commodity jurisdiction determination (see 120.4 of this subchapter).

This clarification will permit the use of radar systems meeting the requirements of DO-365/366 and also allows for development of state of the art multi-function weather radars for use on commercial transports and business jets by providing several new safety features when on final approach for landing. These safety features are in demand my all major aircraft OEM.

If you have any questions or would like to discuss any of the comments provided above, feel free to contact the undersigned at 202-662-2641 or via e-mail at dale.rill@honeywell.com.

Sincerely,

Michael Stonin for

Dale Rill
Director, International Trade
Export Control and Compliance
Honeywell International Inc.

April 13, 2018

Sent via email to: DDTCPublicComments@state.gov

Directorate of Defense Trade Controls
ATTN: Richard Koelling
Office of Defense Trade Controls Policy
U.S. Department of State
Washington, DC 20522-0112

RE: Intel Response to DOS–2017–0017 – Request for Comments Regarding Review of USML Categories V, X and XI (RIN 1400–AE46)

Dear Sir or Madam:

Intel Corporation ("Intel") is pleased to have the opportunity to provide comments on the International Traffic in Arms Regulations (ITAR): USML Category XI, Military Electronics in order to modernize the rules regarding the controls on commercial telecommunications devices and technology. Intel is a leader in designing and building the essential technologies that serve as the foundation for the world's computing and communications devices and as such we strongly support government policies that foster innovation and technology growth.

Through Intel's technology exploration and advancement, Intel identified multiple new technologies that will incorporate defense articles described in subject categories. Most of these are entering into normal commercial use since the most recent revisions to the USML. We focus our comments on three key areas: 5G wireless, autonomous vehicles, and drones. We also address additional areas that are under review for potential commercialization, based on trends in technology development.

A. 5G Cellular Issues

This section describes USML entries that apply to current or near-future development of Fifth Generation Cellular ("5G") systems.

XI(c)(4) ("T/R modules and MMICs")

Control text:

> **XI(c)(4)** Transmit/receive modules or transmit modules that have any two perpendicular sides, with either length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [d≤15cm*GHz/f GHz], with an electronically variable phase shifter or phasers that are a Monolithic Microwave Integrated Circuit (MMIC), or incorporate a MMIC or discrete RF power transistor.

The high-bandwidth frequency ranges under development for 5G are roughly 25 GHz and 40 GHz; these are under active development in the United States and abroad.

At these frequencies, phased-array antennas (also known as "electronically steerable phased array antennas", "beam-forming antennas" or "active electronically scanned array antennas") are the only practical antennas. Fundamental physics dictates that the antenna elements must be spaced less than one-half wavelength apart; one-half wavelength is 15 cm divided by the operating frequency in GHz, exactly the USML control threshold. Since transmission-line or waveguide losses are extremely high at these frequencies, the transmit and receive electronics must be located right next to the antenna elements and therefore themselves be less than one-half wavelength in size in order to fit within the available space. Thus USML XI(c)(4) controls T/R modules for all high-bandwidth 5G antenna systems.

It is our understanding that the U.S. Government is aware of this issue and plans to remedy it with a change to USML Category XI(c)(4) so that it includes peak saturated power output parameters that exceed those described under ECCN 3A001.b.12, along with other changes to resolve the overlap between the USML and CCL. We nonetheless make this comment to preserve the point – and to encourage the U.S. Government to promptly implement the fix in order to help ensure leadership by U.S. companies.

XI(c)(6) ("RF Circulators")

XI(c)(6) Radio frequency circulators of any dimension equal to or less than one quarter (1⁄4) wavelength of the highest operating frequency and isolation greater than 30 dB

Impedance matching of an output power amplifier (PA) to its associated antenna is never perfect, so some RF power will be reflected from the antenna back into the PA, potentially causing damage. In a phased-array antenna, the antenna's impedance varies depending on the angle of the radiated beam, so even approximate impedance matching over the entire directional range of the antenna cannot be achieved.

An "RF circulator" is a passive device that can be inserted between the PA and the antenna to shunt the inevitable reflected power into a "dummy" load rather than returning it to the PA, thereby preventing PA damage. For higher power applications (such as cell phone base stations), such RF circulators are required; therefore 5G base stations will employ these USML-controlled items.

XI(c)(10) ("Null-steering antennas")

XI(c)(10) Antenna, and specially designed parts and components therefor, that:

(i) Employ four or more elements, electronically steer angular beams, independently steer angular nulls, create angular nulls with a null depth greater than 20 dB, and achieve a beam switching speed faster than 50 milliseconds;

(ii) Form adaptive null attenuation greater than 35 dB with convergence time less than one second;

(iii) Detect signals across multiple RF bands with matched left hand and right hand spiral antenna elements for determination of signal polarization; or

(iv) Determine signal angle of arrival less than two degrees (e.g., interferometer antenna).

Null-steering satisfying subparagraphs (i) and (ii) will be required in some 5G base stations in order to avoid interference with neighboring base stations, and from large nearby metal objects. Angular resolution satisfying subparagraph (iv) may be required to locate and selectively beam to individual handsets. Therefore, this entry will apply to 5G cellular base stations. An exclusion for commercial applications would solve this problem.

B. Drones & Self-Driving Cars

Self-driving cars must be able to recognize objects in their surroundings – roads, sidewalks, signs, other cars, animals, pedestrians, bicycles, etc. To do so, many different sensors will be required, including radar, synthetic aperture and inverse synthetic aperture radar, and LIDAR. Similar requirements apply to drones. There are 29 subcategories in XI(a)(3), "Radar systems and equipment…"; several will control equipment and technologies for drones and self-driving cars:

(ii) Synthetic Aperture Radar (SAR) incorporating image resolution less than (better than) 0.3 m, or incorporating Coherent Change Detection (CCD) with geo-registration accuracy less than (better than) 0.3 m, not including concealed object detection equipment operating in the frequency range from 30 GHz to 3,000 GHz and having a spatial resolution of 0.1 milliradians up to and including 1 milliradians at a standoff distance of 100 m;

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SAR is useful for resolving details of targets such as cars, sings, trees, pedestrians, bicycles, etc., and is being incorporated into some drones and self-driving cars.

(iii) Inverse Synthetic Aperture Radar (ISAR);

ISAR is similar in principle to SAR, except that ISAR uses the motion of the radar target to improve imaging resolution.

(xii) Radar incorporating pulsed operation with electronics steering of transmit beam in elevation and azimuth;

Both self-driving cars and drones will need radar with object location in both elevation and azimuth (e.g., bridges/overpasses/low-hanging tree branches);

(xvii) Radar having moving target indicator (MTI) or pulse-Doppler processing where any single Doppler filter provides a normalized clutter attenuation of greater than 60dB;

It is not clear whether this much clutter-removal will be needed, but it is essential for self-driving cars to detect a moving pedestrian against other moving traffic (e.g., a pedestrian crossing a street with background cross-traffic).

(xxi) Radar employing non-cooperative target recognition (NCTR) (i.e., the ability to recognize a specific platform type without cooperative action of the target platform)

Radar with NCTR are required for self-driving cars in order to recognize other cars, trucks, bicycles, pedestrians, children, animals (none of which possess transponders) – since their future behavior depends radically on being detected.

(xxii) Radar employing automatic target recognition (ATR) (i.e., recognition of target using structural features (e.g., tank versus car) of the target with system resolution better than (less than) 0.3 m);

Similar requirement to the previous explanation.

(xxviii) Radar target generators, projectors, or simulators, specially designed for radars controlled by this category;

Target generators and simulators will be required during development and perhaps production in order to test automotive and drone radars.

C. Unique to Drones

XI(a)(3)(i) Airborne radar that maintains positional state of an object or objects of interest, other than weather phenomena, in a received radar signal through time;

It is not entirely clear what is controlled here, but drones need to maintain awareness of objects such as trees, signs, and (if flying low) people and vehicles.

VIII(h)(12) Unmanned aerial vehicle (UAV) flight control systems and vehicle management systems with swarming capability (i.e., UAVs interact with each other to avoid collisions and stay together, or, if weaponized, coordinate targeting) (MT if for an aircraft, excluding manned aircraft, or missile that has a "range" equal to or greater than 300 km);

Though not weaponized, swarms of drones will be used to locate the perimeters of forest fires or other disasters, locate multiple missing people (say, lost hikers), herds of animals, etc. Today these groups of drones are operated from the ground, but as technology becomes more sophisticated, a drone will be able to direct other drones to support with medical supplies, fire retardant, etc.

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D. Additional Areas of Focus

Intel expects that USML category V chemicals/materials will be utilized in the semiconductor manufacturing processes within the next 2-3 years. While some of these chemicals may warrant handling under the USML, a use and consumption exemption would allow commercial companies to more easily use the chemicals. For example, if an ITAR controlled chemical needs to be exported for commercial manufacturing a company can following the standard process to obtain authorization. Once the chemical is introduced into the commercial manufacturing process, an exemption allows the company to handle the chemical under the jurisdiction of the tool or process in which it is being used. This exemption allows commercial activities to continue without significant disruption until the Department of State determines that such a chemical is outside the scope of the Arms Export Control Act (AECA).

Summary

In conclusion Intel appreciates the opportunity to offer comment. Based on Intel's analysis of the items enumerated in USML XI, four entries in the category have already been identified for standard commercial use in the next two years. Intel expects that technological advancements will require the incorporation of more ITAR controlled items faster than the regulations can be modified. Therefore, Intel recommends DDTC consider the following approaches to enable technology advancements and not hinder commercial development:

1) The Department of State should completely eliminate the XI(c)(4) decontrol as it has been overtaken by the implementation of 3A001.b.12 by the Wassenaar Arrangement.

2) Carve out items that are designed for commercial end-use yet are enumerated on the USML. For example, a note to USML XI(c)(10) states that it does not control Traffic Collision Avoidance Systems (TCAS) equipment conforming to FAA TSO C-119c. Similarly, the Department of State could add a note in the ITAR stating that the control does not apply for commercial applications.

3) Offer an exemption for non-126.1 foreign persons who are working on commercial research and development leveraging items and/or technology that is enumerated on the USML.

4) Intel further recommends the USG consider a transition exemption that states "items that are enumerated on the USML but are intended for incorporation into a commercial system are controlled under the EAR when part of that commercial system." This approach is not a long term solution because it does not allow for standard commercial activity such as product development, the export of replacement parts and technology transfers to occur under the EAR. However, this solution would limit the impact on commercial business opportunities when there are lengthy delays on regulatory changes.

Intel appreciates the opportunity to comment on the Notice of Inquiry and looks forward to continuing its cooperation with the U.S. Government on export control reform.

Best Regards,

Jeff Rittener
Jeff Rittener
Vice President, Global Trade
Intel Corporation

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April 13, 2018

VIA REGULATIONS.GOV
DOCKET NUMBER DOS-2017-0017

U.S. Department of State
Office of Policy
Directorate of Defense Trade Controls
PM/DDTC, SA-I, Room 1200
2401 E Street, NW
Washington, DC 20037

ATTN: Request for Comments Regarding Review of USML Categories V, X and XI

SUBJECT: Response of Johnson Matthey Inc. to Notice of Inquiry Requesting Comments on United States Munitions List Categories V, X, and XI

USML Category: V(f)(4)(xv)

Dear Ms. Wubneh:

This letter is submitted by Johnson Matthey Inc. ("JMI") in response to the Notice of Inquiry ("NOI") published by the Directorate of Defense Trade Controls ("DDTC") on February 12, 2018 seeking comments on changes to United States Munitions List ("USML") Categories V, X, and XI.[1]

These comments are limited to USML Category V(f)(4)(xv). As outlined below, JMI respectfully requests DDTC and the interagency to modify the text of the broad scope of USML Category V(f)(4)(xv) to make it clear that the following bis-phosphino ferrocene product lines JMI produces in the United States for commercial applications are not subject to the International Traffic in Arms Regulations ("ITAR") but instead are subject to the export control jurisdiction of the Export Administration Regulations ("EAR"): (i) bis-phosphino ferrocene ligands, including bis-diphenylphosphino ferrocene ("DPPF"); (ii) rhodium bis-phosphino ferrocene catalysts ("Rhodium"); and (iii) palladium bis-phosphino ferrocene catalysts ("Palladium") (collectively, "Bis-Phosphino Ferrocenes").

While previous Commodity Jurisdiction determinations held that several of JMI's Bis-Phosphino Ferrocene products were within the scope of USML Category V(f)(4)(xv)

[1] 83 Fed. Reg. 5970 (Feb.12, 2018).

as it is currently written[2], in response to JMI's request for reconsideration of these CJs, the DDTC indicated that it would be appropriate to examine the proper export controls jurisdiction of JMI's Bis-Phosphino Ferrocene products in the review of USML Category V that is the subject of this NOI.[3]

Based on our review of the Commerce Control List, as well as the Missile Technology Control Regime Annex and the European Union ("EU") Dual-Use List, it appears that JMI's Bis-Phosphino Ferrocene products should be subject to the export controls jurisdiction of the EAR.[4]

I. Background Information on JMI

Located in Wayne, Pennsylvania, JMI is a U.S. subsidiary of United Kingdom-based Johnson Matthey Plc ("JM"). JMI is involved in the production and development of emission control technologies, catalysts, precious metal products, specialty chemicals, and other products for sustainable technologies.

JMI's West Deptford, New Jersey facility produces chemical catalysts, including Bis-Phosphino Ferrocenes for various commercial and industrial applications, including for agrochemical and pharmaceutical end-uses.

II. Overview of JMI's Bis-Phosphino Ferrocene Products

JMI's Bis-Phosphino Ferrocene products are catalysts or components of catalysts that are designed to enable the production of pharmaceutical and agrochemical products.

All of JMI's Bis-Phosphino Ferrocenes were developed for commercial applications. JMI's Bis-Phosphino Ferrocenes were not "specially designed" for a military end-use and JMI did not receive any U.S. or non-U.S. government funding to develop these products.

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[2] See CJs 0219-16, 0220-16, and 0221-16.

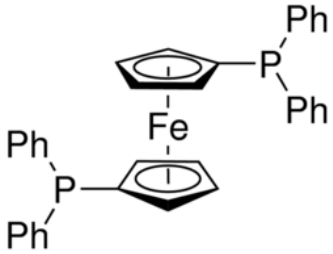
[3] See August 22, 2017 Letter from Deputy Assistant Secretary Brian Nilsson to JMI's outside counsel in response to request for reconsideration of CJs 0219-16, 0220-16, and 0221-16.

[4] It appears that the appropriate classification is EAR99. If the interagency panel disagrees with that classification, it is worth noting the EU classifies these products as "dual use" under 1C111c.6.o. Because Bis-Phosphino Ferrocenes are not propellants or constituent materials for propellants it appears the proper classification should be EAR99 or alternatively a modified version of ECCN 1C111 that mirrors the EU classification.

The following is a selection of JMI's family of Bis-Phosphino Ferrocene products that are produced in the United States.

A. Diphenylphosphino Ferrocene (DPPF)

A representative product in JMI's Bis-Phosphino Ferrocene product family is diphenylphosphino ferrocene (DPPF). The International Union of Pure and Applied Chemistry (IUPAC) name for DPPF is 1,1′-bis(diphenylphosphino)ferrocene. The chemical formula of DPPF is $C_{34}H_{28}FeP_2$ and the chemical structure is as follows:



The CAS number of DPPF is: 12150-46-8.

The Safety Data Sheet for DPPF is included as Attachment 1.

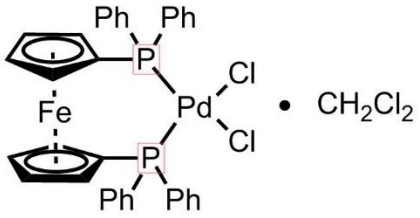
DPPF, an example of a Bis-Phosphino Ferrocene, is an organophosphorus compound commonly used as a ligand in homogeneous catalysis. Specifically, DPPF is typically used as a component in combination with a precious metal precatalyst, such as palladium acetate or dibenzylidineacetone palladium, to furnish active catalysts that perform a variety of well documented reactions, specifically: cross-coupling reactions and hydrogenation reactions. These reactions are used to construct complex organic molecules for use in commercial pharmaceutical and agrochemical applications.

B. Palladium and Rhodium Ferrocene Catalysts

JMI also produces Palladium and Rhodium Ferrocene Catalysts which are catalyst complexes containing the precious metals palladium and rhodium that can be bound to DPPF or other phosphino ferrocene ligands. Palladium and Rhodium Ferrocene Catalysts perform well documented reactions, specifically a wide range of cross-coupling and hydrogenation reactions that are essential to the production of certain pharmaceutical and agrochemical products.

A representative JMI Palladium Ferrocene Catalyst is Pd-106. The International Union of Pure and Applied Chemistry (IUPAC) name for Pd-106 is: dichloro [1,1'-bis(diphenylphosphino)ferrocene] palladium (II) dichloromethane adduct.

The chemical formula of Pd-106 is: $PdCl_2[(C_5H_4P(C_6H_5)_2)_2Fe]CH_2Cl_2$ and includes a chemical solvent. The chemical structure is as follows:



Pd-106

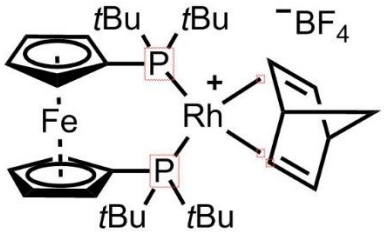
The CAS number of Pd-106 is: 95464-05-4.

The Safety Data Sheet for Pd-106 is included as Attachment 2.

A representative product in JMI's Rhodium Ferrocene Catalyst product family is Rh-136.

The International Union of Pure and Applied Chemistry (IUPAC) name for Rh-136 is: 1,1'-bis(di-tert-butylphosphino)ferrocene(norbornadiene)rhodium(I) tetrafluoroborate.

The molecular formula of Rh-136 is: $C_{33}H_{52}BF_4FeP_2Rh$ and the chemical structure is as follows:



Rh-136

This product does not have a CAS number.

The Safety Data Sheet for Rh-136 is included as Attachment 3.

III. Bis-Phosphino Ferrocenes Should Not be Subject to the Export Controls Jurisdiction of the ITAR

The NOI states that it is DDTC's intent that the USML should be a "positive list" that describes export controlled items using "objective criteria". In addition, the NOI states that the USML should control those defense articles "that provide [the U.S. with] a critical military or intelligence advantage . . . without inadvertently controlling items in normal commercial use."

Bis-Phosphino Ferrocenes are a textbook example of products that are in normal commercial use that should not be subject to the ITAR. Because Bis-Phosphino Ferrocenes are currently subject to the ITAR and require a DSP-5 to be exported or re-exported, JMI's staff spends a great deal of time and effort in obtaining export authorizations. JMI has lost sales in the past because of the delay in obtaining such licenses. JMI believes it has also lost sales because non-US customers prefer not to purchase products that are subject to the ITAR due to the associated compliance issues, including the "see through rule". If Bis-Phosphino Ferrocenes are subject to the EAR, JMI would likely be able to increase its production of these products at its West Deptford, New Jersey facility and open new export markets.

Bis-Phosphino Ferrocenes should not be subject to the export controls jurisdiction of the ITAR for the following reasons.

A. Bis-Phosphino Ferrocenes Were Designed and are Used for Commercial Applications

Bis-Phosphino Ferrocenes produced and sold by JMI are purely commercial products designed for commercial end-uses and used, predominantly—if not exclusively—in the production of pharmaceutical and agrochemical products.

Bis-Phosphino Ferrocenes are mainly sold by JMI to U.S. and non-U.S. pharmaceutical companies to enable the production of active pharmaceutical ingredients ("APIs") used in the production of life-saving drugs, such as those used to treat Hepatitis, HIV, and Alzheimer's disease.

Bis-Phosphino Ferrocenes (*i.e.*, mono-phosphines or bis-phosphines) have no known military end-use. To the best of JMI's knowledge, the Bis-Phosphino Ferrocenes produced and sold by JMI could not in any practical way be used as a rocket propellant burning rate modifier. The products were not "specially designed" as propellants nor have they ever been modified for that end-use or sold to customers for such purposes. Bis-Phosphino Ferrocenes are not useable as rocket propellant burning rate modifiers in solid propellants because, unlike carbon based derivatives, they burn at a very low rate. Unlike the other ferrocene derivatives listed in USML Category V(f)(4), JMI's Bis-Phosphino Ferrocenes contain fewer carbons and no nitrates, rendering them virtually unusable as solid propellants. To the best of JMI's knowledge, there are no known companies that currently market, buy, or sell these products for such an end-use.

In addition, Bis-Phosphino Ferrocenes that contain platinum group metals ("PGM") are precious metal-based compounds, which are, depending on metal prices, 60 to 80 times more expensive than analogous materials that lack a precious metal component, making the use of these products in rocket propellants not viable.

B. Bis-Phosphino Ferrocenes Are Currently Produced Outside the United States

JMI is aware that many Bis-Phosphino Ferrocenes are produced outside of the U.S. For example, DPPF is produced by a JM affiliate in China and by unaffiliated companies in Canada and Russia. Palladium Ferrocene Catalysts are produced in India by a JM affiliate in India and by unaffiliated companies in countries such as Germany and Belgium.

JMI can provide DDTC with the names of the non-U.S. producers upon request.

Because these products are produced outside of the U.S. and are widely available, they do not provide a "critical military or intelligence advantage" to the U.S. and do not warrant control under the ITAR.

Moving Bis-Phosphino Ferrocenes from the export controls jurisdiction of the USML to the EAR would likely increase U.S. production of these products.

C. Bis-Phosphino Ferrocenes are Not Included in the MTCR Annex or the Commerce Control List and Appear to be Classified as EAR99

USML Category V(f)(4)(xv) currently reads as follows:

> (xv) Other ferrocene derivatives that do not contain a six carbon aromatic functional group attached to the ferrocene molecule (MT if usable as rocket propellant burning rate modifier).

While the language in USML Category V(f)(4)(xv) appears to have been written to exclude a single product, which is a ferrocene molecule bearing benzene ring (six carbon aromatic) substituents well known in the industry as the "QPhos" ligand, the language as it is currently written is broad enough to cover a wide range of commercial products that have no rocket propellant applications.

In addition, USML Category V(f)(4)(xv) is not consistent with the Missile Technology Control Regime ("MTCR") controls on ferrocene derivatives.

As noted in Attachment 4, Category II, Item 4.C.6.c.2 of the MTCR Annex contains a positive list of ferrocene derivatives that are controlled as well as a "catch-all" provision that covers "Other ferrocene derivatives usable as rocket propellant burning rate modifiers". This provision also includes a note that states as follows:

> Item 4.C.6.c.2.o does not control ferrocene derivatives that contain a six carbon aromatic functional group attached to the ferrocene molecule.

Unlike the U.S., the EU includes the MTCR Annex language covering ferrocene derivatives on its list of dual-use items ("EU Dual-Use List"). Specifically, the EU classifies these products in category 1C111.C.6.o, which covers:

> o. Other ferrocene derivatives usable as rocket propellant burning rate modifiers, other than those specified in the Military Goods Controls.[5]

This provision also includes the same text used in the MTCR note:

> Note: 1C111.c.6.o. does not control ferrocene derivatives that contain a six carbon aromatic functional group attached to the ferrocene molecule.

It is JMI's understanding that Japan and Switzerland also control exports of ferrocene in the same way as the EU.

By contrast, the current version of USML Category V(f)(4)(xv) captures all ferrocene derivatives, including Bis-Phosphino Ferrocenes, applying MT controls on ferrocene derivatives usable as burning rate modifiers.

Because Bis-Phosphino Ferrocenes should not be included on the USML they should be subject to the export controls jurisdiction of the EAR.[6]

IV. Suggested Changes to USML Category V(f)(4)(xv)

Because Bis-Phosphino Ferrocenes produced by JMI are commercial products developed for and used by the pharmaceutical and agrochemical industries, they should not be covered by the USML. As a result, USML Category V(f)(4)(xv) should be modified to make it clear that Bis-Phosphino Ferrocenes are not covered.

There are two approaches that can be used, including:

1. Deleting the text of USML Category V(f)(4)(xv) and replacing it with a specific positive list of ferrocene derivatives used as rocket propellant burning rate modifiers, including the related CAS numbers. This would be consistent with DDTC's goal of creating a positive list.

2. Another approach would be to maintain the current language in USML Category V(f)(4)(xv) and include a statement that "Bis-Phosphino Ferrocenes are specifically excluded from this category."

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[5] See http://ec.europa.eu/transparency/regdoc/rep/3/2015/EN/3-2015-6823-EN-F1-3-ANNEX-4.PDF.

[6] See footnote 4 for discussion of the EAR classification.

V. Conclusion

As discussed above, Bis-Phosphino Ferrocenes, such as DPPF and others produced by JMI, are commercial products developed for and used by the pharmaceutical and agrochemical industries and are produced in a number of countries.

As a result, Bis-Phosphino Ferrocenes should not be subject to the export controls jurisdiction of the ITAR and should be subject to the export controls jurisdiction of the EAR. For the foregoing reasons, the text of USML Category V(f)(4)(xv) should be revised to make it a positive list that makes it clear that Bis-Phosphino Ferrocene products used for commercial applications are not covered by the USML.

If DDTC or the interagency have any questions, or would like to speak to JMI chemists familiar with these products, please contact me at zawacac@jmusa.com or (610) 971-3089.

Respectfully submitted,

Anita Zawacki
North America Trade Compliance Manager
and Empowered Official
Johnson Matthey Inc.

Attachments:

1. DPPF Safety Data Sheet
2. Pd-106 Safety Data Sheet
3. Rh-136 Safety Data Sheet
4. MTCR Annex Category II; Item 4 – Controls on Ferrocene Derivatives

cc: David Whitehouse, Johnson Matthey Plc
Jonathan Satinsky, Johnson Matthey Inc.

ATTACHMENT 1

Johnson Matthey
Inspiring science, enhancing life

SAFETY DATA SHEET

Conforms to Hazard Communication Standard 2012 (HCS 2012)

1,1'-bis(diphenylphosphino)ferrocene

Product code : C7022
Version : 1
Date of issue/ Date of revision : 06/04/2018
Date of previous issue : No previous validation

Section 1. Identification

Product identifier : 1,1'-bis(diphenylphosphino)ferrocene
Product code : C7022
Product type : Solid.

Relevant identified uses of the substance or mixture and uses advised against

Identified uses
Catalyst.

Specific uses : Chemical synthesis.

Supplier : Johnson Matthey Inc,
2001 Nolte Drive,
West Deptford,
NJ 08066
USA

e-mail address of person responsible for this SDS : EHS_WDept@matthey.com

Emergency telephone number

Telephone number : For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call 1-800-424-9300 or +(1) 703-527-3887 CHEMTREC International (24 hours). Collect calls accepted.
For emergency calls only. Non-emergency calls cannot be serviced at this number.

Hours of operation : 24 hours

Section 2. Hazards identification

To the best of our knowledge, the toxicological properties of this product have not been thoroughly investigated.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2A
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Causes serious eye irritation.
Causes skin irritation.
May cause respiratory irritation.

Precautionary statements

Prevention : Wear protective gloves. Wear eye or face protection. Use only outdoors or in a well-ventilated area. Avoid breathing dust. Wash hands thoroughly after handling.

Response : IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Other means of identification : Not available.

CAS number/other identifiers

CAS number : 12150-46-8

Ingredient name	%	CAS number
1,1'-bis(diphenylphosphino)ferrocene	100	12150-46-8

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

Section 3. Composition/information on ingredients

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : May cause respiratory irritation.

Skin contact : Causes skin irritation.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Section 4. First aid measures

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : No specific fire or explosion hazard.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
phosphorus oxides
metal oxide/oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Section 6. Accidental release measures

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Move containers from spill area. Avoid dust generation. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
1,1'-bis(diphenylphosphino)ferrocene	None.

Section 8. Exposure controls/personal protection

Appropriate engineering controls : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Solid.

Color : Yellow. Orange.

Odor : Not available.

Odor threshold : Not available.

pH : Not available.

Melting point : 181°C (357.8°F)

Section 9. Physical and chemical properties

Boiling point	:	Not available.
Flash point	:	Not available.
Evaporation rate	:	Not available.
Flammability (solid, gas)	:	Non-flammable in the presence of the following materials or conditions: open flames, sparks and static discharge.
Lower and upper explosive (flammable) limits	:	Not available.
Vapor pressure	:	Not available.
Vapor density	:	Not available.
Relative density	:	Not available.
Solubility	:	Insoluble in the following materials: cold water.
Solubility in water	:	Not available.
Partition coefficient: n-octanol/water	:	Not available.
Auto-ignition temperature	:	Not available.
Decomposition temperature	:	Not available.
Viscosity	:	Not available.
Flow time (ISO 2431)	:	Not available.
Molecular weight	:	554.39 g/mole

Section 10. Stability and reactivity

Reactivity	:	No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	:	No specific data.
Incompatible materials	:	No specific data.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Section 11. Toxicological information

Conclusion/Summary

Skin : Causes skin irritation.

Eyes : Causes eye irritation.

Respiratory : May cause respiratory irritation.

Sensitization

Mutagenicity

Carcinogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
1,1'-bis(diphenylphosphino)ferrocene	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not applicable.

Information on the likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : May cause respiratory irritation.

Skin contact : Causes skin irritation.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Section 11. Toxicological information

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Conclusion/Summary : Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Conclusion/Summary : Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Not available.

Mobility in soil

Section 12. Ecological information

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	ADR/RID	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-	-	-	-
Transport hazard class (es)	-	-	-	-	-	-
Packing group	-	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.	No.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2A
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

Composition/information on ingredients

Name	%	Classification
1,1'-bis(diphenylphosphino) ferrocene	100	SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

State regulations

Massachusetts : This material is not listed.

New York : This material is not listed.

New Jersey : This material is not listed.

Pennsylvania : This material is not listed.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Section 15. Regulatory information

Not listed.

Inventory list

Australia	:	Not determined.
Canada	:	Not determined.
China	:	Not determined.
Europe	:	Not determined.
Japan	:	**Japan inventory (ENCS)**: Not determined. **Japan inventory (ISHL)**: Not determined.
Malaysia	:	Not determined.
New Zealand	:	Not determined.
Philippines	:	Not determined.
Republic of Korea	:	Not determined.
Taiwan	:	Not determined.
Thailand	:	Not determined.
Turkey	:	Not determined.
United States	:	This material is listed or exempted.
Viet Nam	:	Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	/	2
Flammability		0
Physical hazards		0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

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Section 16. Other information

Procedure used to derive the classification

Classification	Justification
SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Expert judgment Expert judgment Expert judgment

History

Date of issue/Date of revision : 06/04/2018

Date of previous issue : No previous validation

Version : 1

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

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It is the policy of Johnson Matthey to update this information regularly. You are therefore advised to check that this sheet is the most recent issue.

ATTACHMENT 2

Johnson Matthey
Inspiring science, enhancing life

SAFETY DATA SHEET

Conforms to Hazard Communication Standard 2012 (HCS 2012)

Pd-106; dichloro [1,1’-bis(diphenylphosphino)ferrocene] palladium(II) dichloromethane adduct

Product code	:	C4085
Version	:	1
Date of issue/ Date of revision	:	20/02/2018
Date of previous issue	:	No previous validation

Section 1. Identification

Product identifier	:	Pd-106; dichloro [1,1’-bis(diphenylphosphino)ferrocene] palladium(II) dichloromethane adduct
Chemical name	:	Palladium, [1,1'-bis(diphenylphosphino-κP)ferrocene]dichloro-, (SP-4-2)-, compd. with dichloromethane (1:1)
Product type	:	Solid.

Relevant identified uses of the substance or mixture and uses advised against

Identified uses
Catalyst.

Specific uses	:	Catalyst.
Supplier	:	Johnson Matthey Inc, 2001 Nolte Drive, West Deptford, NJ 08066 USA
e-mail address of person responsible for this SDS	:	EHS_WDept@matthey.com

Emergency telephone number

Telephone number	:	For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call 1-800-424-9300 or +(1) 703-527-3887 CHEMTREC International (24 hours). Collect calls accepted. For emergency calls only. Non-emergency calls cannot be serviced at this number.
Hours of operation	:	24 hours

Section 2. Hazards identification

To the best of our knowledge, the toxicological properties of this product have not been thoroughly investigated.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : COMBUSTIBLE DUSTS
ACUTE TOXICITY (oral) - Category 4
ACUTE TOXICITY (dermal) - Category 4
ACUTE TOXICITY (inhalation) - Category 4
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2A
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : May form combustible dust concentrations in air.
Harmful if swallowed, in contact with skin or if inhaled.
Causes serious eye irritation.
Causes skin irritation.
May cause respiratory irritation.

Precautionary statements

Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing. Use only outdoors or in a well-ventilated area. Avoid breathing dust. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Response : IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth. IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or physician if you feel unwell. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store locked up.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Keep container tightly closed. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Prevent dust accumulation.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : Palladium, [1,1'-bis(diphenylphosphino-κP)ferrocene]dichloro-, (SP-4-2)-, compd. with dichloromethane (1:1)

Other means of identification : Not available.

CAS number/other identifiers

CAS number : 95464-05-4

Ingredient name	%	CAS number
Palladium, [1,1'-bis(diphenylphosphino-κP)ferrocene]dichloro-, (SP-4-2)-, compd. with dichloromethane (1:1)	100	95464-05-4

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Wash with plenty of soap and water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. If necessary, call a poison center or physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Section 4. First aid measures

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Harmful if inhaled. May cause respiratory irritation.

Skin contact : Harmful in contact with skin. Causes skin irritation.

Ingestion : Harmful if swallowed.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical powder.

Unsuitable extinguishing media : Avoid high pressure media which could cause the formation of a potentially explosible dust-air mixture.

Specific hazards arising from the chemical : May form explosible dust-air mixture if dispersed.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
phosphorus oxides
halogenated compounds
metal oxide/oxides

Section 5. Fire-fighting measures

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Additional information : The residue, ash or char left after a fire may have catalytic properties and may promote the re-ignition of flammable materials and vapours.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Avoid dust generation. Using a vacuum with HEPA filter will reduce dust dispersal. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Prevent dust accumulation. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Electrical equipment and lighting should be protected to appropriate standards to prevent dust coming into contact with hot surfaces, sparks or other ignition sources. Take precautionary measures against electrostatic discharges. To avoid fire

Section 7. Handling and storage

or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Palladium, [1,1'-bis(diphenylphosphino-κP)ferrocene]dichloro-, (SP-4-2)-, compd. with dichloromethane (1:1)	None.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 8. Exposure controls/personal protection

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Solid. [Powdered solid.]

Color : Orange. Red.

Odor : Not available.

Odor threshold : Not available.

pH : Not available.

Melting point : 290°C (554°F)

Boiling point : Not available.

Flash point : Not available.

Evaporation rate : Not available.

Flammability (solid, gas) : The residue, ash or char left after a fire may have catalytic properties and may promote the re-ignition of flammable materials and vapours.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : Not available.

Relative density : Not available.

Solubility : Insoluble in the following materials: cold water.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not available.

Section 9. Physical and chemical properties

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Not available.

Flow time (ISO 2431) : Not available.

Molecular weight : 816.64 g/mole

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The material is supplied in a stable condition and other than the previously mentioned catalytic hazards of this material, no specific reactive hazards are known. The catalytic properties of this material may give it a low ignition temperature (except when supplied as a paste). The catalytic properties will also promote the oxidation and possible ignition of flammable liquids and vapours. A used, filtered catalyst should, therefore, be kept wet and out of contact with combustible vapours and liquids.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Prevent dust accumulation.

Incompatible materials : Reactive or incompatible with the following materials:
oxidizing materials

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Conclusion/Summary : Harmful by inhalation, in contact with skin and if swallowed.

Irritation/Corrosion

Conclusion/Summary

Skin : Causes skin irritation.

Eyes : Causes eye irritation.

Respiratory : May cause respiratory irritation.

Sensitization

Section 11. Toxicological information

Mutagenicity

Carcinogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Palladium, [1,1'-bis(diphenylphosphino-κP)ferrocene]dichloro-, (SP-4-2)-, compd. with dichloromethane (1:1)	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not applicable.

Information on the likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : Harmful if inhaled. May cause respiratory irritation.

Skin contact : Harmful in contact with skin. Causes skin irritation.

Ingestion : Harmful if swallowed.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Section 11. Toxicological information

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Conclusion/Summary : Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Conclusion/Summary : Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Not available.

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Return accumulated waste material to the refinery for metal recovery, or dispose of in accordance with local and national regulations.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	ADR/RID	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-	-	-	-
Transport hazard class (es)	-	-	-	-	-	-
Packing group	-	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.	No.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : COMBUSTIBLE DUSTS
ACUTE TOXICITY (oral) - Category 4
ACUTE TOXICITY (dermal) - Category 4
ACUTE TOXICITY (inhalation) - Category 4
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2A
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

Composition/information on ingredients

Name	%	Classification
Palladium, [1,1'-bis(diphenylphosphino-κP) ferrocene]dichloro-, (SP-4-2)-, compd. with dichloromethane (1:1)	100	COMBUSTIBLE DUSTS ACUTE TOXICITY (oral) - Category 4 ACUTE TOXICITY (dermal) - Category 4 ACUTE TOXICITY (inhalation) - Category 4 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

State regulations

Massachusetts : This material is not listed.

New York : This material is not listed.

New Jersey : This material is not listed.

Pennsylvania : This material is not listed.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Section 15. Regulatory information

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia	:	Not determined.
Canada	:	Not determined.
China	:	Not determined.
Europe	:	Not determined.
Japan	:	**Japan inventory (ENCS)**: Not determined. **Japan inventory (ISHL)**: Not determined.
Malaysia	:	Not determined.
New Zealand	:	Not determined.
Philippines	:	Not determined.
Republic of Korea	:	Not determined.
Taiwan	:	This material is listed or exempted.
Thailand	:	Not determined.
Turkey	:	Not determined.
United States	:	This material is listed or exempted.
Viet Nam	:	Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	/	2
Flammability		3
Physical hazards		0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

Section 16. Other information

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
COMBUSTIBLE DUSTS	Expert judgment
ACUTE TOXICITY (oral) - Category 4	Expert judgment
ACUTE TOXICITY (dermal) - Category 4	Expert judgment
ACUTE TOXICITY (inhalation) - Category 4	Expert judgment
SKIN IRRITATION - Category 2	Expert judgment
EYE IRRITATION - Category 2A	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Expert judgment

History

Date of issue/Date of revision : 20/02/2018

Date of previous issue : No previous validation

Version : 1

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

Information in this publication is believed to be accurate and is given in good faith, but it is for the Customer to satisfy itself of the suitability for its own particular purpose. Accordingly, Johnson Matthey gives no warranty as to the fitness of the Product for any particular purpose and any implied warranty or condition (statutory or otherwise) is excluded except to the extent that such exclusion is prevented by law. Freedom under Patent, Copyright and Designs cannot be assumed.
It is the policy of Johnson Matthey to update this information regularly. You are therefore advised to check that this sheet is the most recent issue.

ATTACHMENT 3

Johnson Matthey
Inspiring science, enhancing life

SAFETY DATA SHEET

Conforms to Hazard Communication Standard 2012 (HCS 2012)

1,1'-bis (di-tert-butylphosphino) ferrocene (norbornadiene) rhodium (I) tetrafluoroborate

Product code : C3088
Version : 1
Date of issue/ Date of revision : 06/04/2018
Date of previous issue : No previous validation

Section 1. Identification

Product identifier : 1,1'-bis (di-tert-butylphosphino) ferrocene (norbornadiene) rhodium (I) tetrafluoroborate
Product code : C3088
Product type : Powder.

Relevant identified uses of the substance or mixture and uses advised against

Specific uses : Catalyst.

Supplier : Johnson Matthey Inc,
2001 Nolte Drive,
West Deptford,
NJ 08066
USA

e-mail address of person responsible for this SDS : EHS_WDept@matthey.com

Emergency telephone number

Telephone number : For Chemical Emergency ONLY (spill, leak, fire, exposure or accident) call 1-800-424-9300 or +(1) 703-527-3887 CHEMTREC International (24 hours). Collect calls accepted.
For emergency calls only. Non-emergency calls cannot be serviced at this number.

Hours of operation : 24 hours

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : COMBUSTIBLE DUSTS

GHS label elements

Signal word : Warning

Section 2. Hazards identification

Hazard statements : May form combustible dust concentrations in air.

Precautionary statements

Prevention : Not applicable.

Response : Not applicable.

Storage : Not applicable.

Disposal : Not applicable.

Supplemental label elements : Keep container tightly closed. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Prevent dust accumulation.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Other means of identification : Not available.

CAS number/other identifiers

CAS number : Not available.

Ingredient name	%	CAS number
1,1'-bis (di-tert-butylphosphino) ferrocene (norbornadiene) rhodium (I) tetrafluoroborate	100	-

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Section 4. First aid measures

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes.

Inhalation : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
irritation
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical powder.

Unsuitable extinguishing media : Avoid high pressure media which could cause the formation of a potentially explosible dust-air mixture.

Specific hazards arising from the chemical : May form explosible dust-air mixture if dispersed.

Section 5. Fire-fighting measures

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
phosphorus oxides
halogenated compounds
metal oxide/oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Additional information : The residue, ash or char left after a fire may have catalytic properties and may promote the re-ignition of flammable materials and vapours.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Vacuum or sweep up material and place in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing dust. Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Prevent dust accumulation. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Electrical equipment and lighting should be protected to appropriate standards to prevent dust coming into contact with hot surfaces, sparks or other ignition sources. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Do not store above the following temperature: 25°C (77°F). Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
1,1'-bis (di-tert-butylphosphino) ferrocene (norbornadiene) rhodium (I) tetrafluoroborate	None.

Appropriate engineering controls : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Section 8. Exposure controls/personal protection

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields. If operating conditions cause high dust concentrations to be produced, use dust goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state : Solid. [Powder.]

Color : Orange.

Odor : None.

Odor threshold : Not available.

pH : Not applicable.

Melting point : Not available.

Boiling point : Decomposition temperature: 25°C (77°F)

Flash point : Not available.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Section 9. Physical and chemical properties

Vapor pressure	:	Not available.
Vapor density	:	Not available.
Relative density	:	Not available.
Solubility	:	Insoluble in the following materials: cold water and hot water.
Solubility in water	:	Not available.
Partition coefficient: n-octanol/water	:	Not available.
Auto-ignition temperature	:	Not available.
Decomposition temperature	:	25°C (77°F)
Viscosity	:	Not applicable.
Flow time (ISO 2431)	:	Not available.
Molecular weight	:	772.32 g/mole

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The material is supplied in a stable condition and other than the previously mentioned catalytic hazards of this material, no specific reactive hazards are known. The catalytic properties of this material may give it a low ignition temperature (except when supplied as a paste). The catalytic properties will also promote the oxidation and possible ignition of flammable liquids and vapours. A used, filtered catalyst should, therefore, be kept wet and out of contact with combustible vapours and liquids.

Possibility of hazardous reactions : Hazardous reactions or instability may occur under certain conditions of storage or use.

Conditions to avoid : Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Prevent dust accumulation.

Incompatible materials : Reactive or incompatible with the following materials:
oxidizing materials

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary

Skin : Not available.

Eyes : Not available.

Respiratory : Not available.

Sensitization

Mutagenicity

Carcinogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Name	Result
Not available.	

Information on the likely routes of exposure : Routes of entry anticipated: Oral, Dermal, Inhalation.

Potential acute health effects

Eye contact : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes.

Inhalation : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Section 11. Toxicological information

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
irritation
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Conclusion/Summary : Not available.

General : Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Conclusion/Summary : Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Section 12. Ecological information

Not available.

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Return accumulated waste material to the refinery for metal recovery, or dispose of in accordance with local and national regulations.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	ADR/RID	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-	-	-	-
Transport hazard class (es)	-	-	-	-	-	-
Packing group	-	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.	No.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 14. Transport information

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : COMBUSTIBLE DUSTS

Composition/information on ingredients

Name	%	Classification
1,1'-bis (di-tert-butylphosphino) ferrocene (norbornadiene) rhodium (I) tetrafluoroborate	100	COMBUSTIBLE DUSTS

State regulations

Massachusetts : This material is not listed.

New York : This material is not listed.

New Jersey : This material is not listed.

Pennsylvania : This material is not listed.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Section 15. Regulatory information

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia	:	Not determined.
Canada	:	Not determined.
China	:	Not determined.
Europe	:	Not determined.
Japan	:	**Japan inventory (ENCS)**: Not determined. **Japan inventory (ISHL)**: Not determined.
Malaysia	:	Not determined.
New Zealand	:	Not determined.
Philippines	:	Not determined.
Republic of Korea	:	Not determined.
Taiwan	:	Not determined.
Thailand	:	Not determined.
Turkey	:	Not determined.
United States	:	This material is not listed.
Viet Nam	:	Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)

Health	/	0
Flammability		3
Physical hazards		0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

Section 16. Other information

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
COMBUSTIBLE DUSTS	On basis of test data

History

Date of issue/Date of revision : 06/04/2018

Date of previous issue : No previous validation

Version : 1

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

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ATTACHMENT 4

MISSILE TECHNOLOGY CONTROL REGIME

(M.T.C.R.)

EQUIPMENT, SOFTWARE AND TECHNOLOGY ANNEX

19th October 2017

The agreed changes are shown in bold in the following Items: **Technical Note to 3.A.2, 3.B.3., 4.B.3.a., 4.B.3.b., Technical Note to 4.C., 6.C.9.a., 9.A.8.b., 9.B.2.c., 9.B.2.d., 9.B.2.e., Note to 10.A., 10.E.1., 11.A.3. and Acronyms.**

An agreed deletion of text affects Item **9.A.8.a.**

4.C.6. Other propellant additives and agents as follows:

a. Bonding agents as follows:
   1. Tris (1-(2-methyl)aziridinyl) phosphine oxide (MAPO) (*CAS 57-39-6*);
   2. 1,1′,1″-trimesoyl-tris(2-ethylaziridine) (HX-868, BITA) (*CAS 7722-73-8*);
   3. Tepanol (HX-878), reaction product of tetraethlylenepentamine, acrylonitrile and glycidol (*CAS 68412-46-4*);
   4. Tepan (HX-879), reaction product of tetraethlylenepentamine and acrylonitrile (*CAS 68412-45-3*);
   5. Polyfunctional aziridine amides with isophthalic, trimesic, isocyanuric, or trimethyladipic backbone also having a 2-methyl or 2-ethyl aziridine group;

   Note:

   Item 4.C.6.a.5. includes:
   1. 1,1'-Isophthaloyl-bis(2-methylaziridine) (HX-752) (CAS 7652-64-4);
   2. 2,4,6-tris(2-ethyl-1-aziridinyl)-1,3,5-triazine (HX-874) (CAS 18924-91-9);
   3. 1,1'-trimethyladipoylbis(2-ethylaziridine) (HX-877) (CAS 71463-62-2).

b. Curing reaction catalysts as follows:
   Triphenyl bismuth (TPB) (*CAS 603-33-8*);

c. Burning rate modifiers, as follows:
   1. Carboranes, decaboranes, pentaboranes and derivatives thereof;
   2. Ferrocene derivatives, as follows:
      a. Catocene (*CAS 37206-42-1*);
      b. Ethyl ferrocene (*CAS 1273-89-8*);
      c. n-Propyl ferrocene (*CAS 1273-92-3*) / iso-propyl ferrocene (*CAS 12126-81-7*);
      d. n-Butyl ferrocene (*CAS 31904-29-7*);
      e. Pentyl ferrocene (*CAS 1274-00-6*);
      f. Dicyclopentyl ferrocene (*CAS 125861-17-8*);
      g. Dicyclohexyl ferrocene;
      h. Diethyl ferrocene (*CAS 1273-97-8*);
      i. Dipropyl ferrocene;

j. Dibutyl ferrocene (*CAS 1274-08-4*);
k. Dihexyl ferrocene (*CAS 93894-59-8*);
l. Acetyl ferrocene (*CAS 1271-55-2*) / 1,1'-diacetyl ferrocene (*CAS 1273-94-5*);
m. Ferrocene carboxylic acid (*CAS 1271-42-7*) / 1,1'-Ferrocenedicarboxylic acid (*CAS 1293-87-4*);
n. Butacene (*CAS 125856-62-4*);
o. Other ferrocene derivatives usable as rocket propellant burning rate modifiers;

Note:

Item 4.C.6.c.2.o does not control ferrocene derivatives that contain a six carbon aromatic functional group attached to the ferrocene molecule.

d. Esters and plasticisers as follows:
1. Triethylene glycol dinitrate (TEGDN) (*CAS 111-22-8*);
2. Trimethylolethane trinitrate (TMETN) (*CAS 3032-55-1*);
3. 1,2,4-butanetriol trinitrate (BTTN) (*CAS 6659-60-5*);
4. Diethylene glycol dinitrate (DEGDN) (*CAS 693-21-0*);
5. 4,5 diazidomethyl-2-methyl-1,2,3-triazole (iso- DAMTR);
6. Nitratoethylnitramine (NENA) based plasticisers, as follows:
a. Methyl-NENA (*CAS 17096-47-8*);
b. Ethyl-NENA (*CAS 85068-73-1*);
c. Butyl-NENA (*CAS 82486-82-6*);
7. Dinitropropyl based plasticisers, as follows:
a. Bis (2,2-dinitropropyl) acetal (BDNPA) (*CAS 5108-69-0*);
b. Bis (2,2-dinitropropyl) formal (BDNPF) (*CAS 5917-61-3*);

e. Stabilisers as follows:
1. 2-Nitrodiphenylamine (*CAS 119-75-5*);
2. N-methyl-p-nitroaniline (*CAS 100-15-2*).

4.C.7. 'Gel propellants' specifically formulated for use in the systems specified in 1.A., 19.A.1. or 19.A.2.

Technical Note:

A 'gel propellant' is a fuel or oxidiser formulation using a gellant such as silicates, kaolin (clay), carbon or any polymeric gellant.

N.B. CAS numbers included in Item 4.C. are Technical Notes. For the use of CAS numbers in the Annex, see Introduction Section (f).

Technical Note:

Substance groupings in Item 4.C. (e.g. fuels, oxidisers, etc.) describe typical applications of propellant substances. A substance remains specified by Item 4.C. even when used in an application other than the typical one indicated by its grouping (e.g. hydrazinium perchlorate* (CAS 27978-54-7) *is grouped as a fuel but can also be used as an oxidiser).

4.D. SOFTWARE

4.D.1. "Software" specially designed or modified for the operation or maintenance of equipment specified in 4.B. for the "production" and handling of materials specified in 4.C.

4.E. TECHNOLOGY

4.E.1 "Technology", in accordance with the General Technology Note, for the "development", "production" or "use" of equipment or materials specified in 4.B. and 4.C.

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April 13, 2018

Sent via email to: DDTCPublicComments@state.gov

Directorate of Defense Trade Controls
Office of Defense Trade Controls Policy
U.S. Department of State
Washington, DC 20522-0112

RE: Docket Number DOS–2017–0017 – Request for Comments Regarding Review of USML Categories V, X and XI (RIN 1400–AE46)

Dear Sir or Madam:

Keysight Technologies, Inc. is pleased to have the opportunity to provide comments on the International Traffic in Arms Regulations: USML Category XI, Military Electronics.

Keysight is a manufacturer of electronic test and measurement equipment, which is used by a wide range of customers (commercial, industrial, research, academic, government) for a wide range of end uses. Our equipment is principally subject to the EAR. Certain entries within USML Cat. XI potentially apply to some end uses of our products and other entries potentially overlap with some EAR controls.

As requested in the NOI, our comments are intended to assist the DDTC in improving the existing language of Category XI to create a positive list that describes items using structured subparagraphs and, where possible, objective criteria.

I. USML entry XI(b); proposal for modification

The USML provides the following language for Category XI(b):

> *(XI)(b) Electronic systems, equipment or software, not elsewhere enumerated in this subchapter, specially designed for intelligence purposes that collect, survey, monitor, or exploit, or analyze and produce information from, the electromagnetic spectrum (regardless of transmission medium), or for counteracting such activities.*

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To accomplish the national security objectives of USML XI(b) but without inadvertently controlling (or creating ambiguity by appearing to control) items in normal commercial use, we suggest revising the paragraph as follows:

> ***XI(b) Electronic systems and equipment, not elsewhere enumerated in this subchapter or described in ECCNs 3A002.a.7, 3A002.c, 5A001.f, or 5A980, specially designed for intelligence purposes, and [being] any of the following:***
>
> > ***(1) Specially designed for the extraction of voice, data, or metadata from a transmission using the electromagnetic spectrum (regardless of transmission medium);***
> >
> > ***(2) Specially designed for analysis of voice, data, or metadata produced from an article described in XI(b)(1);***
> >
> > ***(3) Specially designed for counteracting activities described in XI(b)(1) or XI(b)(2); or***
> >
> > ***(4) Funded by the Department of Defense or a U.S. Government intelligence agency via contract or other funding authorization.***
>
> ***Note: "Specially designed for intelligence purposes" means equipment or systems developed with capabilities that are uniquely used by government military or non-military intelligence agencies for electronic intelligence (ELINT) and signals intelligence (SIGNIT) purposes. It does not control general purpose systems and equipment, such as network packet analyzers, traffic loggers, oscilloscopes and signal analyzers, that collect information from, survey, or monitor the electromagnetic spectrum.***
>
> ***Note 1 to paragraph (b)(4): The paragraph does not control systems or equipment (a) determined to be subject to the EAR via a commodity jurisdiction determination (see sec. 120.4 of this subchapter), or (b) identified in the relevant Defense Department or intelligence agency contract or other funding authorization as being developed for U.S.***

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government intelligence and non-government (i.e., commercial) applications.

Note 2 to paragraph (b)(4): Note 1 does not apply to defense articles enumerated or elsewhere described on the USML, whether in production or development.

Note 3 to paragraph (b)(4): This paragraph is applicable only to those contracts and funding authorizations that are dated [two years after the effective date], or later.

Rationales for each of the suggested edits to Category XI(b) are described below.

A. <u>Excluding Items within the scope of ECCNs 3A002.a.7, 3A002.c, 5A001.f, and 5A980.</u>

To the extent that an item is objectively described in an ECCN, it would be excluded from the USML. There is a precedent for using ECCN descriptions to define the scope of a USML entry. Specifically, USML Category V(a)(38) controls "Explosives, not otherwise enumerated in this paragraph **or on the CCL in ECCN 1C608** *[emphasis added],* with a detonation velocity exceeding 8700 m/s at maximum density or a detonation pressure exceeding 34 Gpa (340 kbar)." ECCN 1C608 describes, using technical and other objective parameters, a list of explosives and related items. Similarly, ECCNs 3A002.a.7, 3A002.c, 5A001.f, and 5A980 describe a list of electronic collection and related items using technical and other objective parameters. These ECCNs are clear in their scope and we believe that industry has not had difficulty in understanding their scope.

Items controlled on the CCL are, by definition, commercial or dual-use items. As stated in the NOI's preamble, one of DDTC's goals is to ensure that the USML does not control commercial or dual-use items. Excluding items that are within the scope of these positively controlled CCL entries from the scope of XI(b) would be an efficient way of accomplishing this goal. Moreover, the ECCNs are controlled for National Security or Surreptitious Listening reasons. Thus, the USG has the authority to control their export to destinations, end uses, and end users of concern.

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Importantly, references within the USML to ECCNs do not impact the order of review: the USML paragraph still governs, but its scope simply excludes by reference items that are objectively described in an ECCN.

B. Including Electronic Systems or Equipment Funded by the Defense Department or an Intelligence Agency

To the extent that an item was funded, in whole or in part, by the Defense Department or one of the intelligence agencies, then the item would still be subject to the ITAR pursuant to the broad new catch-all funding provision we suggest adding as XI(b)(4). Here too there is a precedent: the jurisdiction-by-funding construct was added to USML XI(a)(7) to control on the ITAR items where US government funding was a key indicator that the item warranted the controls of the ITAR (unless declared otherwise in a Commodity Jurisdiction determination) but the ability to describe such items in a positive way was too difficult. The same policy concerns that apply to XI(a)(7) developmental electronics apply to XI(b) intelligence electronics. We believe that a broad control based on government funding is reasonable in this case, due to the inherent difficulty in describing in detail items of military application. It also allows for narrowing the scoping elements in XI(b)(1) by mitigating the risk/concern that sensitive intelligence items warranting ITAR control would become subject to the EAR. To the extent that an item specially designed for intelligence purposes does not warrant ITAR control, the Commodity Jurisdiction process provides a mechanism for the State Department, based on input from the Defense and Commerce Departments, to make case-by-case determinations.

C. Define "Specially Designed for Intelligence Purposes"

"Specially designed for intelligence purposes" is an inherently difficult phrase to define. It is, however, critical to do so because, absent a definition, the phrase can be interpreted in ways that would capture items designed for and used for non-military, non-intelligence agency, non-government commercial intelligence or other information gathering. The essential aspect is to define the phrase in a way that does not control items that are for commercial applications (unless funded by the Defense Department or an intelligence agency, as described above). To the extent that dual-use/commercial items are sensitive, they would be described and controlled in the referenced ECCNs. The use of the word "uniquely" in our proposed definition would exclude dual-use/commercial items from

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XI(b), and the reference to ELINT and SIGNIT would be precise enough because they are terms of art well understood in the intelligence community.

D. <u>Include in control articles specially designed for the extraction from, or analysis of, information from electromagnetic spectrum, and items designed to counter-act such equipment</u>

Our proposed subparagraphs XI(b)(1), (2), and (3) are the essential content of the existing XI(b). By dividing it into three subparagraphs, it becomes more readable and the scope of control becomes clearer. This also allows easier jurisdictional analyses of the three basic types of systems and equipment that are caught by the category.

Within XI(b)(1), we propose slight re-wording to describe more precisely what we believe the State Department's objective is in having such controls. Specifically, we believe that "extraction" is more precise than the existing phrase "collect, survey and monitor". This is because many types of purely commercial equipment, such as power meters and frequency counters, collect, survey, and monitor frequencies in the electromagnetic spectrum but we believe are not intended to be captured by XI(b). Further, we propose to limit the scope of control to "extraction" should be of "voice, data or metadata" because we believe that these information-bearing elements are pertinent to intelligence-gathering.

II. USML entry XI(c)(4); proposal for deletion

The USML provides the following language for entry XI(c)(4):

> *XI(c)(4): Transmit/receive modules or transmit modules that have any two perpendicular sides, with either length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [d≤15cm*GHz/fGHz], with an electronically variable phase shifter or phasers that are a Monolithic Microwave Integrated Circuit (MMIC), or incorporate a MMIC or discrete RF power transistor.*

A substantially similar and overlapping CCL entry, ECCN 3A001.b.12 (reproduced below), was added to the EAR on Aug. 15, 2017, as part of the implementation of the Wassenaar

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Arrangement 2016 Plenary Agreements (RIN 0694-AH35; 82FR38764). Indeed, that implementation rule noted the overlap and included a Related Control that refers to USML Category XI.

> *3A001.b.12 'Transmit/receive modules,' 'transmit/receive MMICs,' 'transmit modules,' and 'transmit MMICs,' rated for operation at frequencies above 2.7 GHz and having all of the following:*
>
> > *a. A peak saturated power output (in watts), Psat, greater than 505.62 divided by the maximum operating frequency (in GHz) squared [Psat > 505.62 W * GHz2/fGHz2] for any channel;*
> >
> > *b. A "fractional bandwidth" of 5% or greater for any channel;*
> >
> > *c. Any planar side with length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [d ≤ 15cm * GHz * N/fGHz] where N is the number of transmit or transmit/receive channels; and*
> >
> > *d. An electronically variable phase shifter per channel.*
>
> *Technical Notes:*
> *1. A 'transmit/receive module' is a multifunction "electronic assembly" that provides bi-directional amplitude and phase control for transmission and reception of signals.*
>
> *2. A 'transmit module' is an "electronic assembly" that provides amplitude and phase control for transmission of signals.*
>
> *3. A 'transmit/receive MMIC' is a multifunction "MMIC" that provides bi-directional amplitude and phase control for transmission and reception of signals.*
>
> *4. A 'transmit MMIC' is a "MMIC" that provides amplitude and phase control for transmission of signals.*
>
> *5. 2.7 GHz should be used as the lowest operating frequency (fGHz) in the formula in 3A001.b.4.12.c for transmit/receive or transmit modules that have a rated*

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*operation range extending downward to 2.7 GHz and below [d ≤ 15cm * GHz * N/2.7 GHz].*

6. 3A001.b.12 applies to 'transmit/receive modules' or 'transmit modules' with or without a heat sink. The value of d in 3A001.b.12.c does not include any portion of the 'transmit/receive module' or 'transmit module' that functions as a heat sink.

7. 'Transmit/receive modules' or 'transmit modules,' 'transmit/receive MMICs' or 'transmit MMICs' may or may not have N integrated radiating antenna elements where N is the number of transmit or transmit/receive channels.

Items captured by ECCN 3A001.b.12 are subject to National Security controls (NS Column 2) of the EAR and license exception LVS applies for exports less than $5,000.

ECCN subparagraph 3A002.b.12.c uses the same formula for dimension/size that is used in XI(c)(4). Further, whereas XI(c)(4) refers to modules, ECCN 3A002.b.12 extends the scope of control to also cover MMICs.

Keysight believes that XI(c)(4) is now redundant, having been superseded by 3A001.b.12. Accordingly, we respectfully suggest that XI(c)(4) should be deleted (or removed and reserved).

III. USML entry Category XI(c)(8); proposal for modifcation

The USML provides the following language for entry XI(c)(8):

XI(c)(8): Digital radio frequency memory (DRFM) with RF instantaneous input bandwidth greater than 400 MHz, and 4 bit or higher resolution whose output signal is a translation of the input signal (e.g., changes in magnitude, time, frequency) and specially designed parts and components therefor;

Keysight believes that this entry should be understood as controlling only DRFMs that are designed for use in electronic warfare applications. We further believe that it was not intended to capture DRFM-like equipment designed for and utilized in *bona fide* civil applications, such as automotive radar test. Therefore, we propose to clarify and narrow the

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scope of XI(c)(8) to only cover specially designed parts or components of electronic warfare systems or equipment captured in specific subparagraphs in XI(a) and all of XI(b):

> *XI(c)(8): Digital radio frequency memory (DRFM)* ***specially designed for systems in paragraphs (a)(4)(i), (a)(4)(iii), (a)(7) or (b) of this category****, with RF instantaneous input bandwidth greater than 400 MHz, and 4 bit or higher resolution whose output signal is a translation of the input signal (e.g., changes in magnitude, time, frequency) and specially designed parts and components therefor;*

There is precedent within Category XI for this approach of referring to other USML entries (see, e.g., XI(c)(14) and XI(c)(16)). If DDTC were to find that DRFMs are relevant for other USML categories, the list of paragraph references could be adjusted accordingly.

IV. Summary and Conclusion

We again thank you for the opportunity to provide comments on USML Category XI. Please contact me at 719-590-1999 or jonathan_wise@keysight.com should you have questions regarding these comments.

Sincerely,

Jonathan Wise
Trade Policy Manager
Keysight Technologies, Inc.

Leonardo DRS, Inc.
Trade Compliance Office
2345 Crystal Drive
Suite 1000
Arlington, VA 22202

April 12, 2018

Mr. Michael Miller
Acting Deputy Assistant Secretary
Directorate of Defense Trade Controls
U.S. Department of State
Washington, DC 20522-0112

Subject: Response to the Notice of Inquiry (NOI): Request for Comments Regarding the United States Munitions List (USML) Categories V, X, and XI - 83FR5970

Dear Mr. Miller,

Leonardo DRS, Inc. appreciates the opportunity to comment on the Notice of Inquiry requesting comments regarding USML Categories V, X, and XI. These categories, as currently published, are a significant improvement over the original categories. However, there are still several entries within these categories that are problematic for industry insomuch that they are either overly broad, vague, and/or control items that are available outside the U.S. and controlled as dual-use items. The following are our specific comments regarding this NOI.

1. X(a)(7) Goggles, spectacles, visors, vision blocks, canopies, or filters for optical sights or viewers, employing other than common broadband absorptive dyes or UV inhibitors as a means of protection (e.g., narrow band filters/dyes or broadband limiters/coatings with high visible transparency), having an optical density greater than 3, and that protect against:
    (i) Multiple visible (in-band) laser wavelengths;
    (ii) Thermal flashes associated with nuclear detonations; or
    (iii) Near infrared or ultraviolet (out-of-band) laser wavelengths; or

We recommend this entry and its associated component/part entries, X(d)(2) and X(d)(3) be deleted. The goggles controlled by this entry are safety goggles to protect individual's eyes. They are available globally as commercial items, at optical densities significantly higher than 3, and are used in industrial and research laboratory settings. Regarding X(a)(7)(ii), items producing nuclear detonations are not regulated under the ITAR. We believe that optical protection against such detonations should not be so regulated either.

2. XI(a)/*(b): General Comment.

The use of "systems or equipment" continues to be a significant challenge. The current definition of "equipment" in §120.45(h) (*e.g.*: "*a combination of parts, components, accessories, attachments, firmware, or software that operate together to perform a function of, as, or for an end-item or system*") is so broadly stated that "equipment" essentially constitutes anything that makes up a "system." This definition of "equipment" forces an extremely lengthy review of systems and everything that makes up such systems, resulting in items being captured therein that should not be. For example, an aircraft intercom panel that allows the pilots to talk to each other that meets the cited TEMPEST standards, would be controlled as XI(a)*(5), which is also controlled as significant military equipment. The enumerated system itself is controlled under

the XI(a) entries and the software for such systems is controlled under XI(d). If an item within a system is of such military importance, then that item should be enumerated in XI(c) rather than relying on the very broad approach of "systems or equipment." As such, we recommend the word "equipment" be removed from XI(a) and *(b).

3. XI(a)*(1) Underwater hardware, equipment, or systems, as follows

As written, this entry contains the word "hardware," wherein the word/term "hardware" is not defined (within §120.45 or elsewhere), and appears redundant in relation to the defined terms "system" (§120.45(g)) and "equipment" (§120.45(h)) already stipulated in the entry. As such, we recommend the word "hardware" be removed from XI(a)*(1).

4. XI(a)*(3)(i) Airborne radar that maintains positional state of an object or objects of interest, other than weather phenomena, in a received radar signal through time.

As written, this entry appears to control all airborne radar that maintains such a positional state of any object, including ground objects, moving or stationary, which results in it capturing civil search and rescue radars, including current solid-state radars all the way down to 60-year old non-coherent magnetron radars (vacuum tube technology). We would hope the intent of the department is to not control civil search and rescue radars as being military. Any truly military radar, airborne or ground based, is enumerated elsewhere in XI(a)(3). We recommend the entry be revised to clarify its intent is with regard to civil radars employed for search and rescue.

5. XI(a)*(3)(ii) Synthetic Aperture Radar (SAR) incorporating image resolution less than (better than) 0.3 m, or incorporating Coherent Change Detection (CCD) with geo-registration accuracy less than (better than) 0.3 m, not including concealed object detection equipment operating in the frequency range from 30 GHz to 3,000 GHz and having a spatial resolution of 0.1 milliradians up to and including 1 milliradians at a standoff distance of 100 m;

This entry captures all such radars as military regardless of design intent. Accurately detecting and depicting items with a radar is not uniquely military. Such SAR radars have multiple commercial uses, including geophysical assessment and research, disaster damage assessment, and agricultural assessment. wherein SAR's as a technology are not exclusively military in application. We recommend this entry be deleted.

6. XI(a)*(3)(iii) Inverse Synthetic Aperture Radar (ISAR).

This entry captures all such radars as military regardless of design intent. ISAR radars have multiple commercial uses, such as ocean search and rescue operations (as they are able to better differentiate a ship in rough sea state conditions), ocean iceberg research and mapping, and scientific deep space imaging, wherein ISAR's as a technology are not exclusively military in application. We recommend this entry be deleted, and that the entries in XI(a)*(3) that list "SAR" be replaced with "SAR/ISAR." This would apply the military positive criteria of these entries to ISAR, and not designate the technology itself as being uniquely military.

7. XI(a)*(3)((xvii) Radar having moving target indicator (MTI) or pulse-Doppler processing where any single Doppler filter provides a normalized clutter attenuation of greater than 60dB.

As written, this entry appears to capture all radars with MTI regardless of clutter attenuation. That is because as written the clutter attenuation appears to only apply to pulse-Doppler processing. The result of this is that all such radars are controlled here regardless of clutter attenuation. We recommend a comma be added after "…pulse-Doppler processing…" to reflect that the positive criteria applies to the entire entry. Also, the 60 dB criteria should be raised to at least 80 dB to prevent capturing commercial radars such as the NEXRAD WSR-88D weather surveillance radar.

8. XI(a)*(5) Command, control, and communications (C3); command, control, communications, and computers (C4); command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR); and identification systems or equipment, that:

> (i) Are specially designed to integrate, incorporate, network, or employ defense articles that are controlled in paragraphs or subparagraphs of the categories of §121.1 of this part that do not use the term specially designed;
> (ii) Incorporate U.S. government identification friend or foe (IFF) Modes 4 or 5;
> (iii) Implement active or passive ECCM used to counter acts of communication disruption (e.g., radios that incorporate HAVE QUICK I/II, SINCGARS, SATURN);
> (iv) Specially designed, rated, certified, or otherwise specified or described to be in compliance with U.S. government NSTISSAM TEMPEST 1-92 standards or CNSSAM TEMPEST 01-02, to implement techniques to suppress compromising emanations of information bearing signals; or
> (v) Transmit voice or data signals specially designed to elude electromagnetic detection;

We have several concerns with this entry. First, what constitutes a C3, C4, or C4ISR system is completely undefined. That leaves industry with what is commonly understood to be such a system, which is not very common. For example, our search revealed a C3 system can be defined as simple as a superior officer issuing orders to a subordinate over a walkie-talkie and a C4 system can be defined as complicated as an "integrated system of doctrine, procedures, organizational structures, personnel, equipment, facilities, and communications designed to support a commander's exercise of command and control across the range of military operations." Neither of those are adequate for trying to determine if a system or equipment (re. a part or component of such a system) meets the requirements for control under this entry. As such, we strongly recommend further definition be applied to C3, C4, and C4ISR to help industry bound what types of systems are actually eligible for control under this header. Second, as previously stated, we recommend the word "equipment" be removed from the entry.

9. XI(a)*(5)(iv) Specially designed, rated, certified, or otherwise specified or described to be in compliance with U.S. government NSTISSAM TEMPEST 1-92 standards or CNSSAM TEMPEST 01-02, to implement techniques to suppress compromising emanations of information bearing signals;

This entry is problematic in that it captures anything from a helicopter intercom panel to a metal box that a radio sits in because both can be viewed as being components of "command, control, and communications systems." If this were applied to the entire system level, it would not be as encompassing. However, with XI(a)*(5) controlling down to the part/component level, this entry significantly broadens what is most likely intended to be controlled by it. We recommend either limiting its application to the entire system level, or just deleting it.

10. XI(a)(11) Test sets specially designed for testing defense articles controlled in paragraphs (a)*(3), (a)*(4), (a)*(5), or *(b);

We recommend this entry be deleted. A test set is a maintenance tool. It is not the defense article itself. If a test set contains any items of the system, it will be controlled for that reason. The same is true for technical data. If it contains software that meets the definition of technical data or if it contains hardware that reveals technical data relating to the (a)*(3), (a)*(4), (a)*(5), or *(b) items, then it will be controlled for that reason as well. Absent revealing controlled information relating to the (a)*(3), (a)*(4), (a)*(5), or *(b) items, the test equipment should not be controlled here.

11. XI*(b) Electronic systems, equipment or software, not elsewhere enumerated in this sub-chapter, specially designed for intelligence purposes that collect, survey, monitor, or exploit, or analyze and produce information from, the electromagnetic spectrum (regardless of transmission medium), or for counteracting such activities.

We recommend this entry be deleted. Any systems intended to be controlled here should be cited in XI(a). Additionally, the listing of software in this entry is very problematic as such software should rightfully be controlled in XI(d), along with all the other software controlled in this category.

12. XI(c)(2) Printed Circuit Boards (PCBs) and populated circuit card assemblies for which the layout is specially designed for defense articles in this subchapter;

We strongly recommend this entry be deleted. The layout of a circuit board is dependent on many things, including the physical shape and size of the board itself. We believe a PCB should only be controlled under this subchapter if it contains specialized computer chips, unique to the military application or if it contains software/firmware controlled under this subchapter loaded on any non-unique chips. Absent those two positive criteria, we believe such printed circuit boards should not be controlled under this sub-chapter.

As stated previously, the current version of USML Category XI is a significant improvement over its original. We firmly believe our above recommendations will help to better define and focus what the department intends to control within its boundaries. If you require additional information, please contact me at 703-412-0288 or at ghill@drs.com

Sincerely,

Gregory C. Hill
Vice President
Global Trade Compliance
Leonardo DRS, Inc.

April 24, 2018

Submitted Via E-Mail (DDTCPublicComments@state.gov)

Ms. Engda Wubneh
Directorate of Defense Trade Controls
U.S. Department of State
Washington, D.C.

ATTN: Request for Comments Regarding Review of USML Categories V, X, XI (DOS-2007-0017)

Lockheed Martin Corporation (Lockheed Martin) is pleased to submit the following comments in response to the February 12, 2018 notice of inquiry/request for comments regarding review of Categories V, X, XI of the U.S. Munitions List (USML). The comments contained herein relate to Category XI only.

Lockheed Martin appreciates the effort by the Department to periodically review the USML to ensure that controls are clear, do not inadvertently control items in normal commercial use, account for technological developments, and properly implement the national security and foreign policy objectives of the United States. We encourage these reviews to continue. The following comments focus on drafting or other technical issues in the text of Category XI that would greatly benefit from further clarification.

I. UMSL Category XI(a)(5) C3, C4, and C4ISR systems and ID Systems or Equipment

Paragraph XI(a)(5)(ii) controls: Command, control, and communications (C3); Command, control, communications, and computers (C4); Command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR); and identification systems or equipment that "incorporate U.S. government identification friend or foe (IFF) Modes 4 and 5." However, the intent of the paragraph to capture systems that "incorporate" IFF Modes 4 and 5 is unclear. This has a direct impact on how this equipment is used in non-military aircraft and ground-based radars. Some items that incorporate IFF Modes 4 and 5 may be capable of performing in those modes but are limited from doing so.

> *Recommendation*: Control on the USML should be limited to those items that are both "capable" and authorized to perform with the USG encryption components that allow for performance in modes 4 or 5.

II. USML Category XI: Application of the "See Through" Rule

U.S. exporters continue to struggle with the application of the traditional "see through" rule for USML items controlled in Category XI. For example, it is unclear if an unclassified signal processor not enumerated on the USML but intended for use in a Category XI(a)(3) radar should be controlled as a "600 series" item on the Commerce Control List (CCL) or as a Category XI(c)(2) printed circuit board (PCB) because it contains a "specially designed" circuit board for a Category XI radar. Category XI(c)(2) controls PCBs and populated circuit card assemblies for which the layout is specially designed for defense articles in that subchapter.

The final rule published on July 1, 2014 (79 Fed, Reg. 37536) provides the following regarding the intent of controls on PCBs:

> [T]he "Department has revised the controls for [PCBs]. . .providing each with a separate paragraph, and notes that jurisdiction of a [PCB]. . . should follow the jurisdiction of the specific item for which it is designed, as opposed to the overall system into which the article one layer up from the [PCB] is ultimately incorporated.

When applied to Category XI(c)(2), this guidance indicates that jurisdiction is determined by the next higher-level assembly of incorporation. For example, if a CCL "600 series" controller is integrated into a system controlled on the USML that incorporates a PCB, the PCB is also a "600 series" item and could be exported separately from the controller under the jurisdiction of the Department of Commerce.

This interpretation of determining jurisdiction is further supported by guidance provided in ECR FAQs on the DDTC website: "The jurisdiction of a particular application-specific PCB is determined by the jurisdiction of the next higher-level functional assembly for which the PCB was specially designed (i.e., the jurisdiction of the item that drove the design requirements for the PCB in question.)" In short, it is the box in which the PCB is used that guides jurisdiction, not the larger system.

This is an important concept for determining jurisdiction/classification of components that may be subject to control in USML Category XI. Accordingly, it would be useful to confirm the intent of the July 2014 final rule in a note to Paragraph XI(c)(2).

> *Recommendation*: Add a note to Paragraph XI(c)(2) that confirms guidance provided in the July 2014 final rule applies to PCBs integrated into components of a larger ITAR system.

III. USML Category XI(a)(4): Electronic Combat Systems and Equipment

Paragraph XI(a)(4)(iii) controls "systems and equipment specially designed to introduce extraneous or erroneous signals into radar-based seekers, electro-optic based seekers, radio communications receivers, navigation receivers, or that otherwise hinder reception, operation or effectiveness of adversary electronics." This paragraph was not intended to control "jamming equipment" identified on the CCL. ECCN 5A001.f.3 specifically identifies: "Jamming

equipment 'specially designed' or modified to intentionally and selectively interfere with deny, inhibit, degrade, or seduce mobile telecommunications services" performing certain functions, including simulation of Radio Access Network (RAN) equipment, detecting and exploiting specific characteristics of the mobile telecommunications protocol.

There are many examples of this technology being used in the commercial/civil environment. For example, counter-UAV technology may be employed to protect airports, schools, hospitals, accident/crime scenes, etc. from unauthorized intrusion. This technology is appropriately controlled on the CCL.

Recommendation: Provide guidance that clarifies that USML Category XI should not be interpreted to control dual-use technology otherwise controlled on the CCL.

IV. USML Category XI(c)(10): Parts & Components (P&C)

Paragraph XI(c)(10) controls "antenna, and specially designed parts and components therefor" that perform certain functions, as specified in XI(c)(10)(i)-(iv). However, many "specially designed" P&C may include mechanical parts that are structural or serve other innocuous functions (e.g., brackets or power suppliers that can be placed either in or outside the antenna structure). These items do not require control on the USML.

Note also that this P&C issue more generally poses a challenge for ECCN 3A611.x, "Parts," "components," "accessories" and "attachments" that are "specially designed" for a commodity controlled by this entry or for an article controlled by USML Category XI, and not enumerated or described in any USML category or another 600 series ECCN or in Paragraph y. Specially designed mechanical items that do not influence the performance of a system (e.g., brackets, doors, load plates, weldings, etc.) get caught in ECCN 3A611.x, while certain specially-designed electrical/electronic systems are controlled at a lower level in Paragraph y (e.g., connectors, connector parts, transformers, etc.). The control of these mechanical/structural parts of the USML is not necessary to ensure appropriate oversight of these items.

Recommendation: Specially designed P&C controlled by USML XI(c)(10) should be limited to those items that functionally support the performance thresholds/capabilities outlined in the USML. More broadly, the Department should work with the Department of Commerce to ensure that mechanical/structural components are more appropriately controlled on the CCL and ensure ECCN 3A611.x does not inadvertently capture low-level items that do not warrant specific authorization for export.

V. USML Category XI(c)(1) Note 1: Application Specific Integrated Circuits (ASIC)

Note 1 states that: "An ASIC is an integrated circuit developed or produced for a specific application or function regardless of number of customers." Design and development costs for ASICs are driving developments in technology for standardized ASIC design/architecture. These Application Specific Standard Parts (ASSPs) are designed and intended for use in multiple systems. Similar to MIMICs, ASSPs should be controlled as dual-use commodities on the

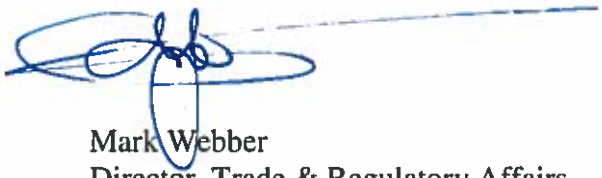
Commerce Control List as opposed to XI(c)(1) ASICs. The use of "ASIC" under XI(c)(1) is not sufficiently clear to determine if the intent is to control ASICs that can only be used in one specific system (e.g., specific radar model) or an ASIC that can used in multiple systems (i.e., ASSP), including those manufactured by other equipment manufacturers.

At issue here is the control of items under development for use in multiple applications.

> *Recommendation*: Note 1 to Paragraph XI(c)(1) should be revised to make clear that chips used in "multiple system designs" (ASSPs) controlled in both USML Category XI or on the CCL are controlled on the CCL. In effect, this reinforces the intent of Note 2 to Paragraph XI(c)(1) that confirms ASICs programmed for 600 series items are controlled in ECCN 3A611.f.

Thank you for the opportunity to provide comments in response to the notice of inquiry regarding USML Category XI. If you have any questions related to these comments or would like additional information related to the issues discussed above, please contact Mark Webber, Director, International Trade Policy, Government & Regulatory Affairs at 703-413-5951 or Mark.J.Webber@lmco.com.

For Lockheed Martin Corporation,



Mark Webber
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MACOM
Partners from RF to Light

April 12, 2018

Submitted via email to: DDTCPublicComments@state.gov
Submitted via www.regulations.gov

Richard Koelling, Acting Director
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Re: Request for Comments Regarding Review of U.S. Munitions List Categories V, X, and XI, and Review of Corresponding Controls on the Commerce Control List

Dear Mr. Koelling and Ms. Hess:

MACOM Technology Solutions Inc. ("MACOM") hereby submits the following public comments in response to the Notice of Inquiry ("NOI") published on February 12, 2018 from the Department of State on U.S. Munitions List ("USML") Categories V, X, and XI (83 FR 5970), and in response to the NOI from the Department of Commerce on controls on energetic materials, armored and protective equipment, and military electronics on the Commerce Control List ("CCL") (83 FR 5968). Our comments below focus on Category XI and related controls for electronics on the CCL.

MACOM is a leading provider of high-performance analog semiconductor solutions that enable next-generation internet applications, the cloud connected apps economy, and the modern, networked battlefield operate across the radio frequency (RF), microwave, millimeter wave, and light wave spectrum. We design and manufacture differentiated, high-value products for customers who demand high performance, quality, and reliability. We offer a broad portfolio of over 5,000 standard and custom devices, which include integrated circuits, multichip modules, power pallets and transistors, diodes, amplifiers, switches and switch limiters, passive and active components and complete subsystems, across approximately 60 product lines serving over 6,500 end customers. Our semiconductor products are electronic components that our customers

incorporate into their larger electronic systems, such as point-to-point wireless backhaul radios, high density networks, active antenna arrays, radar, magnetic resonance imaging systems (MRIs), and unmanned aerial vehicles. Our primary markets include carrier and enterprise infrastructure, wired broadband and cellular backhaul, cellular infrastructure, photonic solutions, data centers, fiber optic applications, military and commercial radar, RF jammers, electronic countermeasures, communication data links, and industrial, medical, test and measurement and scientific applications.

I. Comments on USML Category XI(c)(4)

A. Items Captured in Normal Commercial Use

We believe USML Category XI(c)(4), which applies to certain transmit/receive modules or transmit modules, regardless of design intent, currently controls items in normal commercial use, including one MACOM device in production. MACOM makes the MAMF-011015, which is an 8 – 11 GHz multifunction GaAs X-Band Core Chip designed for communication, radar, and weather applications. The MAMF-011015 integrates a CMOS logic driver with a GaAs transmit/receive MMIC within a single Quad Flat No-Lead package. A datasheet describing the MAMF-011015 more fully is included as **Attachment 1**. This product was originally designed for use in a civilian weather radar program, and MACOM originally intended to market the device to other customers and radar applications, including weather, marine, border protection, emergency management, and avionics. At the time of its development and initial production, the MAMF-011015 was classified as EAR99 because it was designed for a civilian end use and thus did not meet the legacy Category XI(c) nor did it meet the necessary parameters in entries in Export Control Classification Number ("ECCN") 3A001 (or other relevant ECCNs on the CCL). However, once the legacy Category XI(c) was amended to include XI(c)(4), MACOM self-classified the MAMF-011015 under XI(c)(4) upon the effective date of the Category XI changes.

B. Impact of Controlling Commercial Items on the USML

Both NOIs published by the Directorate of Defense Trade Controls ("DDTC") and Bureau of Industry and Security ("BIS") requested comments on the potential cost savings from shifting control of specific commercial items from the USML to the Export Administration Regulations ("EAR"). Controlling a commercial item like the MAMF-011015 under the ITAR leads to additional compliance burdens, such as setting up ITAR-compliant design and manufacturing facilities, as well as imposing a licensing requirement on both the seller and the buyer for every international transaction, as opposed to much fewer controls and other collateral burdens when the product was EAR99.

While compliance cost savings are important, we respectfully argue that lost business directly resulting from controlling commercial items on the USML is far more important, and this is

demonstrated by our experience with the MAMF-011015. We reviewed our prior sales and test/evaluation transactions for this product during the period before the Category XI changes became effective on December 30, 2014 and the period after. We found that when analyzing these transactions on a monthly basis, the transaction activity was, on average, 86% lower after the effective date than the transaction activity prior to the effective date when the product was subject to the EAR. Our commercial customers perceived the ITAR-controlled status of this device as a deal breaker. They universally communicated to us that they did not want a potentially ITAR-controlled component in their commercial systems, and this applied to both domestic and foreign customers. While MACOM continued to ship samples to several domestic customers after the effective date, we were not able to convert this pre-sales activity into revenue, and we attribute this directly to the ITAR controlled status of this device. Further, there have been no shipments to potential customers outside of the U.S. since the Category XI effective date. Customers are understandably concerned about using an ITAR controlled part in their commercial systems, and with viable foreign and comparable EAR99 alternatives available, they have chosen devices from other suppliers. Controlling the MAMF-011015 under the ITAR eliminated this product's commercial viability.

C. Recommended Changes

Should the agencies decide that Category XI(c)(4) should continue to use only positive parameters and performance capabilities to control certain transmit/receive or transmit modules of concern, then we respectfully request that the agencies look to ECCN 3A001.b.12 as a guide for better controlling such items. That ECCN, which was implemented August 15, 2017, adds a power threshold as an additional parameter to control items similar to those in XI(c)(4). Adding a similar power threshold to Category XI(c)(4) would help ensure that items in normal commercial use are not unintentionally controlled under that USML entry.

II. Increasingly Commercialized Technologies

A. Use of Silicon Germanium or Gallium Nitride Substrate

In the course of reviewing the effects of Category XI(c)(4) on our products, we also found that it could potentially affect some of our new products using a silicon germanium ("SiGe") or gallium nitride ("GaN") substrate, and thus we wanted to address these important commercial technologies. The use of SiGe has a key strength in its lower cost and the ability to integrate multiple functions, such as analog, RF, and digital, on a single chip using existing high volume silicon CMOS fabs. One significant consideration when using SiGe, however, is that it has a low power threshold. We have found the combination of high integration and lower power to be very attractive for cost sensitive commercial applications. It is our understanding that SiGe is used in multiple commercial applications, including heterojunction bipolar transistors or CMOS transistors, safety systems for automobiles, smartphones, tablets, GPS receivers, high-speed A/D

and D/A converters, gaming consoles, notebook PCs, and home automation systems. MACOM uses SiGe in our Crosspoint switch products servicing the broadcast video and optical networking applications.

With respect to GaN, MACOM produces GaN transistors for the wireless base station market. In fact, GaN is rapidly gaining acceptance and being used extensively in the commercial wireless market. When measuring GaN RF power device revenue by market segment, ABI Research has reported that wireless infrastructure accounts for about 70% of such revenue, while military applications account for just over 20%. We anticipate that GaN's use in commercial applications will only continue to increase.

Because of the extensive use of SiGe and GaN in commercial applications, we respectfully request that the agencies take care to avoid using positive parameters and technical capabilities (such as those in Category XI(c)(4)) that could potentially catch commercial chips and modules manufactured using these substrates.

B. Developments in Commercial Telecommunications

We are aware of industry concerns that Category XI(c)(4) captures modules being developed for use in 5G. 5G is the fifth generation wireless network systems that are currently being developed. Given Category XI(c)(4) uses only positive parameters and technical capabilities, U.S. industry is understandably concerned that this USML entry serves as an artificial barrier that non-U.S. companies do not have to face, as XI(c)(4) is not part of the Wassenaar Arrangement Munitions List.

The export control concerns regarding next generation telecommunications networks, including 5G, however, go beyond the ITAR. Historically, wireless communications networks operated at or below the 2.6 GHz frequency level, which is below the level at which dual-use export controls begin under ECCN 3A001. As a result, discrete microwave transistors used in wireless communications systems have historically been EAR99, regardless of their peak saturated output power. As the demand for telecommunication bandwidth explodes, today's wireless industry is expanding into the 3.3 GHz – 4.2 GHz and 4.4 GHz – 5.0 GHz frequency bands. These frequency bands are expected to be used by both next generation LTE networks and the emerging 5G systems in the near future. These bands are also demanding considerably higher power than previous generations of telecom technology. Under ECCN 3A001.b.3.a, discrete microwave transistors rated at these higher frequency ranges have much lower power limits (*i.e.*, 115W for frequencies exceeding 3.2 GHz and up to and including 3.7 GHz, and 60W for frequencies exceeding 3.7 GHz and up to and including 6.8 GHz) than what these emerging technologies will be demanding. Our market research indicates that the next generation LTE market is demanding transistors with output powers of up to 500W, a power level significantly above the power thresholds in 3A001.b.3. Similarly, our market research indicates that 5G networks are

demanding a peak saturated output power of 150W at these frequencies, again above the power thresholds in 3A001.b.3.

If the U.S. does not work with other Wassenaar countries to amend the peak saturated power output thresholds in 3A001.b.3 to address the increased demand from this inevitable telecommunication expansion into higher frequencies, we anticipate that American manufacturers will require significant licenses for which potential delays and uncertainties could be imposed on both sellers and buyers of these devices. Further, non-Wassenaar countries will have a significant competitive advantage because they will not be subject to similar licensing requirements, delays and uncertainties. While we understand these concerns go beyond the USML and 600 series ECCNs, we respectfully request that the agencies work together to prepare for emerging communication networks, including next generation LTE and 5G, and review whether such developments warrant changes under the USML, CCL, and relevant Wassenaar controls.

Finally, with respect to ECCN 3A001, we would also like to point out that 3A001.b.2.d has not been properly updated to take into account the European Telecommunications Standards Institute's EN 300 197 standard for the 38 GHz radio band. Microwave monolithic integrated circuit ("MMIC") amplifiers for the 38 GHz radio band are customarily specified from 37.0 GHz upwards (often specified for 37-40 GHz, but also 37-43.5 GHz), and this range crosses over between 3A001.b.2.d and 3A001.b.2.e. ECCN 3A001.b.2.d has a very low threshold for output power at 37 GHz (i.e., 0.1 nW), while 3A001.b.2.e has a much higher threshold for output power (1 W). Consequently, MMIC amplifiers designed for end use in the 38 GHz band are controlled at 37.0 GHz by 3A001.b.2.d. We believe the intent is to not control such MMIC amplifiers under 3A001.b.2.d, and we respectfully request that the agencies work with other Wassenaar members to revise 3A001.b.2.d to apply to "…any frequency exceeding 31.8 GHz up to, but not including, 37.0 GHz" and revise 3A001.b.2.e to apply to "any frequency at 37.0 GHz up to and including 43.5 GHz…" We recognize that this pertains to a non-600 series change, but we believe this issue pertaining to MMIC amplifiers is relevant as such items in 3A001 were an important part of the Category XI review,[1] and we believe it is essential that 3A001 be properly updated in collaboration with Wassenaar partners.

III. Conclusion

Thank you for the opportunity to comment on necessary updates to USML Categories V, X, and XI, as well as on updates to corresponding controls on the CCL. Given the pace of technological change, it is important that the agencies review and update the USML and CCL in a timely

[1] The BIS notice of inquiry on "Civil Uses of Certain Microwave Monolithic Integrated Circuit (MMIC) Power Amplifiers, Discrete Microwave Transistors and Bi-Static and Multi-Static Radar" was published in conjunction with the final rule revising USML Category XI on July 1, 2014. *See* 79 FR 37548.

manner, and we hope that you will take into account our concerns described above. Should you need additional information, please feel free to contact me via email at lisa.kester@macom.com or via telephone at 978-656-2742.

Sincerely,

Lisa Kester
Senior Manager, Trade Compliance

April 12, 2018

Sent via email to: DDTCPublicComments@state.gov

Directorate of Defense Trade Controls
Office of Defense Trade Controls Policy
U.S. Department of State
Washington, DC 20522-0112

RE: Docket Number DOS–2017–0017 – Request for Comments Regarding Review of USML Categories V, X and XI (RIN 1400–AE46)

Dear Sir or Madam:

National Instruments Corporation ("NI"), located at 11500 N Mopac Expwy, Austin TX 78759, is pleased to have the opportunity to provide comments on the International Traffic in Arms Regulations: USML Category XI, Military Electronics.

NI designs, manufactures and sells commercial off-the-shelf (COTS), modular, computer-based hardware and software products, which are used by engineers and scientists in a wide range of applications. NI's COTS products are subject to the jurisdiction of the Export Administration Regulations (EAR) and described in Categories 3, 4, and 5. Several of the subparagraphs of the USML either touch on commercial applications of our products or potentially overlap with existing controls on the CCL. Our comments are intended to assist the DDTC in its effort to revise the category to, as described in the NOI, ensure that it does not describe items in normal commercial use. After a description of the ECCNs that address many of the same policy concerns of USML, we provide suggested text or structured paragraphs with notes.

I. Comments regarding USML Category XI paragraph (b) modification

The USML provides the following language for Category XI(b):

> *(b) Electronic systems, equipment or software, not elsewhere enumerated in this subchapter, specially designed for intelligence purposes that collect, survey, monitor, or exploit, or analyze and produce information from, the electromagnetic spectrum (regardless of transmission medium), or for counteracting such activities.*

Existing ECCNs that Address Policy Objectives of USML XI(b)

Before suggesting changes to XI(b), we would like to provide the DDTC a list of CCL entries which may overlap with Category XI(b).

a. **ECCN 3A002.c.4** captures certain signal analyzing equipment using performance-based criteria:

> *3A002.c.4 "Signal analyzers" having all of the following:*

a. "Real-time bandwidth" exceeding 170 MHz; and
b. Having any of the following:
b.1. 100% probability of discovery, with less than a 3 dB reduction from full amplitude due to gaps or windowing effects, of signals having a duration of 15 µs or less; or
b.2. A "frequency mask trigger" function, with 100% probability of trigger (capture) for signals having a duration of 15 µs or less;

Technical Notes:
1. Probability of discovery in 3A002.c.4.b.1 is also referred to as probability of intercept or probability of capture.

2. For the purposes of 3A002.c.4.b.1, the duration for 100% probability of discovery is equivalent to the minimum signal duration necessary for the specified level measurement uncertainty.

Note: 3A002.c.4 does not apply to those "signal analyzers" using only constant percentage bandwidth filters (also known as octave or fractional octave filters).

Items captured by ECCN 3A002.c.4 are subject to National Security controls of the EAR and license exception LVS applies for exports less than $5,000. We believe that COTS signal analyzers that meet or exceed the control thresholds of this entry would not be "specially designed for intelligence purposes" and thus would not be controlled by the ITAR.

b. **ECCN 5A001.e** captures certain direction-finding equipment using performance-based criteria:

5A001.e Radio direction finding equipment operating at frequencies above 30 MHz and having all of the following, and "specially designed" "components" therefor:

1. "Instantaneous bandwidth" of 10 MHz or more; and
2. Capable of finding a Line Of Bearing (LOB) to non-cooperating radio transmitters with a signal duration of less than 1 ms;

Items captured by ECCN 5A001.e are subject to National Security controls of the EAR. License exception CIV and GBS are available for exports of 5A001.e items. License exception CIV applies to exports to civilian end-uses and GBS applies to exports to countries in country group B. The EAR contains Related Control guidance to refer to USML Cat XI for certain direction-finding equipment (e.g., USML XI(a)(12)).

c. **ECCN 5A001.f** broadly captures interception or jamming, and monitoring equipment:

5A001.f Mobile telecommunications interception or jamming equipment, and monitoring equipment therefor, as follows, and "specially designed" "components" therefor:

1. Interception equipment designed for the extraction of voice or data, transmitted over the air interface;
2. Interception equipment not specified in 5A001.f.1, designed for the extraction of client device or subscriber identifiers (e.g., IMSI, TIMSI or IMEI), signaling, or other metadata transmitted over the air interface;

3. Jamming equipment "specially designed" or modified to intentionally and selectively interfere with, deny, inhibit, degrade or seduce mobile telecommunication services and performing any of the following:

a. Simulate the functions of Radio Access Network (RAN) equipment;
b. Detect and exploit specific characteristics of the mobile telecommunications protocol employed (e.g., GSM); or
c. Exploit specific characteristics of the mobile telecommunications protocol employed (e.g., GSM);

4. Radio Frequency (RF) monitoring equipment designed or modified to identify the operation of items specified in 5A001.f.1, 5A001.f.2 or 5A001.f.3.

Note: 5A001.f.1 and 5A001.f.2 do not apply to any of the following:
a. Equipment "specially designed" for the interception of analog Private Mobile Radio (PMR), IEEE 802.11 WLAN;
b. Equipment designed for mobile telecommunications network operators; or
c. Equipment designed for the "development" or "production" of mobile telecommunications equipment or systems.

N.B. 1: See also the International Traffic in Arms Regulations (ITAR) (22 CFR parts 120-130). For items specified by 5A001.f.1 (including as previously specified by 5A001.i), see also5A980 and the U.S. Munitions List (22 CFR part 121).
N.B. 2: For radio receivers see 5A001.b.5.

Items captured by ECCN 5A001.f.1 are subject to Surreptitious Listening controls and to *Nota Bene* 1. N.B. 1 requires the exporter to consider reviewing the controls of the USML. Here, too, the EAR contains Related Control guidance to refer to the ITAR (USML Cat XI(a)(4)(iii) for certain electronic attack and jamming equipment). We consider this overlap to be instructive, and therefore, we are going to utilize the language in 5A001.f.1 when considering how to revise the structure of XI(b).

Items captured by ECCN 5A001.f.2, 5A001.f.3, and 5A001.f.4 are subject to National Security controls of the EAR. License exception LVS applies to ECCN 5A001.f.2 and 5A001.f.4 where exports are less than $5,000. License exceptions GBS and CIV apply to ECCN 5A001.f.2, 5A001.f.3, and 5A001.f.4. As noted before, license exception CIV applies to exports to civilian end-uses and GBS applies to exports to countries in country group B. The EAR Related Controls guidance applies to these ECCN subparagraphs as well.

d. **ECCN 5A980** is related to 5A001.f.1 and is intended to be a catch-all for surreptitious interception devices not controlled by 5A001.f.1:

5A980 Devices primarily useful for the surreptitious interception of wire, oral, or electronic communications, other than those controlled under 5A001.f.1; and "parts," "components" and "accessories" therefor.

Similar to items captured by ECCN 5A001.f.1, we believe that there could be overlap between 5A980 and the USML, and that the exporter would need to request a CJ for items potentially captured in ECCN

5A980. Should the CJ determine the item was subject to the jurisdiction of the ITAR, the result of the CJ would most likely be to classify the item in XI(b).

Suggested Edits to USML XI(b)
After a review of the above ECCNs, we believe Category XI(b) captures items already controlled by ECCNs in 3A002 and 5A001. Therefore, our suggested revisions will try to draw out differences to ensure the exporter is able to determine whether an item is subject to the EAR or to the ITAR.

To begin, we would recommend the DDTC restructure the text using practices common to multilateral control regimes, such as the Wassenaar Arrangement, to ensure the conjunctions used in Category XI(b) clearly isolate functions requiring AND from those requiring OR. We have highlighted the recommended changes using bold font below:

> *(b) Electronic systems, equipment or software, not elsewhere enumerated in this subchapter, specially designed for intelligence purposes,* ***having any of the following:***
>
> ***(1) Electronic systems, equipment or software that performs all of the following:***
>
> ***(i)*** *Collect**s**, survey**s**, monitor**s**, or exploit**s** the electromagnetic spectrum (regardless of transmission medium), and*
> ***(ii)*** *Analyzes and produces information from, the actions described in XI(b)(1)(i);* ***or***
>
> ***(2) Electronic systems, equipment or software*** *for counteracting activities described in XI(b)(1).*

While the revisions in the proposal above make the application of AND and OR clear to the exporter, we believe additional clarity is needed to capture the intent of several phrases used in XI(b); those phrases are:

1. *for intelligence purposes*

The phrase *for intelligence purposes* is critical because use of the phrase intentionally narrows the capture of XI(b) to those items specially designed for intelligence agencies. While this phrase is inherently difficult to define, use of the phrase is necessary to avoid capture of items designed for and used in non-military, non-intelligence agency, non-government commercial intelligence or other information gathering. Any attempt to define the phrase intelligence purposes should ensure that interpretation of the definition does not result in end use ambiguities, captured by the definition.

To the extent an item was funded, in whole or part, by the Defense Department or one of the intelligence agencies, then the item would still be subject to the ITAR pursuant to broad new catch-all funding provision we suggest adding to XI(b)(4). This jurisdiction-by-funding construct was added to USML XI(a)(7) to control on the ITAR items where US government funding was a key indicator that the item warranted the controls of the ITAR (unless declared otherwise in a Commodity Jurisdiction determination) but the ability to describe such items in a positive way was too difficult. The same policy concerns that apply to XI(a)(7) developmental electronics apply to XI(b) intelligence electronics.

2. *Collects, surveys, monitors*

These terms are not defined in the ITAR and without definitions we must rely on generally accepted definitions by the industry. For example, general purpose signal analyzers, whether or not classified in ECCN 3A002.c.4, and various types of power meters and frequency counters subject to the US Export Administration Regulations can collect, survey or monitor frequencies of the electromagnetic spectrum. We believe the focus should be on the phrase *produce information from* and have suggested removing the terms *collects, surveys, and monitors*.

3. *produce information from*

We believe the phrase *produce information from* intends to describe functionality that would allow a user to extract data (e.g. voice, data or metadata) from a transmission and believe the language from 5A001.f.1 is more suitable to described this action. We also believe post processing of voice, data, or metadata may be carried out by a separate item. Therefore, we are split the extraction and analysis functions into 2 separate subheadings.

Based on the points above, we have proposed an alternative revision for consideration:

(b) Electronic systems, equipment or software, not elsewhere enumerated in this subchapter, specially designed for intelligence purposes, and being any of the following:

(1) Specially designed for the extraction of voice, data or metadata from a transmission using the electromagnetic spectrum (regardless of transmission medium);

(2) Specially designed for analysis of voice, data or metadata produce from an item described in (b)(1);

(3) Specially designed for counteracting activities described in (b)(1) or (b)(2); or

(4) Funded by the Department of Defense via contract or other funding authorization

Note 1 to paragraph (b)(4): This paragraph does not control electronic systems or equipment (a) in production, (b) determined to be subject to the EAR via a commodity jurisdiction determination (see §120.4 of this subchapter), or (c) identified in the relevant Department of Defense contract or other funding authorization as being developed for both civil and military applications.

Note 2 to paragraph (b)(4): Note 1 does not apply to defense articles enumerated on the USML, whether in production or development.

Note 3 to paragraph (b)(4): This paragraph is applicable only to those contracts and funding authorizations that are dated July 1, 2015, or later.

II. Drafting or other technical issues in the text of Category XI(c)(4)

The USML provides the following language for Category XI(c)(4):

> *Transmit/receive modules or transmit modules that have any two perpendicular sides, with either length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [d≤15cm*GHz/fGHz], with an electronically variable phase shifter or phasers that are a Monolithic Microwave Integrated Circuit (MMIC), or incorporate a MMIC or discrete RF power transistor*

As noted by the text underlined below, ECCN 3A001.b.12 of the CCL captures certain transmit/receive modules and MMICs using a dimensional analysis that is identical to XI(c)(4):

> *3A001.b.12 'Transmit/receive modules,' 'transmit/receive MMICs,' 'transmit modules,' and 'transmit MMICs,' rated for operation at frequencies above 2.7 GHz and having all of the following:*
>
> > *a. A peak saturated power output (in watts), Psat, greater than 505.62 divided by the maximum operating frequency (in GHz) squared [Psat > 505.62 W * GHz2/fGHz2] for any channel;*
> >
> > *b. A "fractional bandwidth" of 5% or greater for any channel;*
> >
> > *c. Any planar side with length d (in cm) equal to or less than <u>15 divided by the lowest operating frequency in GHz</u> [d ≤ 15cm * GHz * N/fGHz] where N is the number of transmit or transmit/receive channels; and*
> >
> > *d. An electronically variable phase shifter per channel.*
>
> *Technical Notes:*
> *1. A 'transmit/receive module' is a multifunction "electronic assembly" that provides bi-directional amplitude and phase control for transmission and reception of signals.*
>
> *2. A 'transmit module' is an "electronic assembly" that provides amplitude and phase control for transmission of signals.*
>
> *3. A 'transmit/receive MMIC' is a multifunction "MMIC" that provides bi-directional amplitude and phase control for transmission and reception of signals.*
>
> *4. A 'transmit MMIC' is a "MMIC" that provides amplitude and phase control for transmission of signals.*
>
> *5. 2.7 GHz should be used as the lowest operating frequency (fGHz) in the formula in 3A001.b.4.12.c for transmit/receive or transmit modules that have a rated operation range extending downward to 2.7 GHz and below [d ≤ 15cm * GHz * N/2.7 GHz].*

6. 3A001.b.12 applies to 'transmit/receive modules' or 'transmit modules' with or without a heat sink. The value of d in 3A001.b.12.c does not include any portion of the 'transmit/receive module' or 'transmit module' that functions as a heat sink.

7. 'Transmit/receive modules' or 'transmit modules,' 'transmit/receive MMICs' or 'transmit MMICs' may or may not have N integrated radiating antenna elements where N is the number of transmit or transmit/receive channels.

Items captured by ECCN 3A001.b.12 are subject to National Security controls of the EAR and license exception LVS applies for exports less than $5,000.

XI(c)(4) is an example of a redundant control that unintentionally captures items that have entered normal commercial use or will enter commercial use in the next two to three years. Accordingly, we respectfully request the DDTC to delete XI(c)(4).

III. Drafting or other technical issues in the text of Category XI(c)(8)

The USML provides the following language for Category XI(c)(8):

Digital radio frequency memory (DRFM) with RF instantaneous input bandwidth greater than 400 MHz, and 4 bit or higher resolution whose output signal is a translation of the input signal (e.g., changes in magnitude, time, frequency) and specially designed parts and components therefor;

Following the release of XI(c)(8), efforts have been made to clarify the phrase *Digital Radio Frequency Memory (DRFM)* to be understood as an item designed for use in electronic warfare applications. However, while all DRFMs meeting the control parameters specified in Category XI(c)(8) are controlled under the ITAR, it is understood by industry and the Department of State that DRFMs are designed for use in electronic warfare applications. Therefore, we have attempted to narrow the scope of XI(c)(8) to only cover specially designed parts or components of electronic warfare systems or equipment captured in specific subparagraphs in XI(a) and all of XI(b):

Digital radio frequency memory (DRFM) **specially designed for systems or equipment enumerated and controlled within Category XI (a)(4)(i), (a)(4)(iii), (a)(7) or (b)**, *with RF instantaneous input bandwidth greater than 400 MHz, and 4 bit or higher resolution whose output signal is a translation of the input signal (e.g., changes in magnitude, time, frequency) and specially designed parts and components therefor;*

While we may have missed some entries of concern in the proposal above, we believe a clarifying phrase like the one above is critical to clarify the entry is for electronic warfare and does not control technology utilized in certain civil applications, such as civil automotive radar test equipment.

IV. Conclusion

Thank you for the opportunity to provide comments on Category XI. Please contact me by e-mail at paul.ledet@ni.com or call 512-683-8123 should the DDTC have any additional questions concerning this letter.

Respectfully submitted,

Paul Ledet
Trade Compliance Technology and Classification Manager

NORTHROP GRUMMAN

Northrop Grumman Corporation
Corporate Office

Global Trade Management
2980 Fairview Park Drive
Falls Church, VA 22042

April 13, 2018

Department of State
Bureau of Political-Military Affairs
Department of Defense Trade Controls
2401 E Street, N.W.
12th Floor, SA-1
Washington, D.C. 20522

ATTN: Mr. Richard Koelling
Acting Deputy Director, Defense Trade Controls Policy

SUBJECT: Docket Number DOS–2017–0017, Request for Comments Regarding Review of USML Categories V, X and XI.

Dear Mr. Koelling:

Northrop Grumman Corporation wishes to thank the Department for the opportunity to submit comments in review of USML Categories V, X and XI. In response, we provide the following recommendations:

Category XI:

Use of term "Equipment" in SME paragraphs:
We recommend the term "Equipment" be removed from all SME paragraphs as the term "systems" is already included in these paragraphs and it is the system or end item that warrants SME designation. "Equipment" items that do not operate together to perform a function of an end-item or system are, by definition, components, accessories, attachments, firmware or software and thus should be controlled in XI(c) which is designated for such items. Removing "Equipment" from SME paragraphs will prevent minor components from being unintentionally controlled at the same level as the systems.

XI(a)(5)(iv): Specifically, we recommend removing the term "equipment" from XI(a)(5) which will prevent minor parts and components from being controlled as SME based upon TEMPEST standards. We recommend revising this entry to read "(iv) Systems specified, rated and/or certified, and specially designed to be in compliance with U.S. government NSTISSAM TEMPEST 1-92 standards or CNSSAM TEMPEST 01-02, to implement techniques to suppress compromising emanations of information bearing signals." This would limit XI(a)(5)(iv) to the system level. We further recommend a separate non-SME entry in XI(c) for parts for that are "specified, rated and/or certified, and specially designed to be in compliance with U.S. government NSTISSAM TEMPEST 1-92 standards or CNSSAM TEMPEST 01-02."

XI(a)(1) Underwater hardware, equipment, or systems: We also recommend removing "hardware and equipment" From XI(a)(1) and only controlling systems as SME. Further, we recommend removing the mine and other detection and monitoring controls from Cat IV(c) and VI(f)(8). These overlap with controls of mine detection equipment in * XI(a)(1)(i

& iii) as well as laser mine detection and ranging systems in Cat XII. This would prevent parts and components of Cat XI (and XII laser detection and ranging systems) from being controlled in the specially designed catch-all's in either Cat IV or VI.

Pre-ECR XI(c) items controlled in VIII(h)(1): Final rule *RIN 1400–AD89, Revision of U.S. Munitions List Categories VIII and XIX*, states that "a part or component of an airborne radar system specially designed for the F–35 may not be enumerated or captured in USML Category XI but will be controlled under the specially designed catch-all of Category VIII(h)(1)". This interpretation creates jurisdictional disparities between very similar parts for non-VIII(h)(1) related AESA radars and other Cat XI systems. The USG has already established adequate entries for parts, components, etc. that warrant USML controls under XI(c) for the radar and all Cat XI systems for VIII(h)(1) aircraft. We recommend the USG update guidance to discontinue the practice of controlling former XI(c) parts and components under VIII(h)(1).

If the USG does not agree, we recommend the development of USML entries to enumerate those components believed to require USML controls or, at the very least, create a new paragraph under XI(c) for parts, components, accessories, attachments, and associated equipment of Cat XI (a)(3-5) items that are specially designed for VIII(h)(1) aircraft.

XI(c)(1-3) ASICs, PCB and Multichip Modules: These types of devices are common to commercial electronic components with the vast majority of devices being EAR99. The fact that a PCB is unique (or "specially designed") to a USML defense article does not equate to the fact that it is more capable than and EAR controlled PCB. PCBs are often specially designed for cost verses performance. We therefore recommend the USG establish actual performance thresholds for ASICs, PLDs, CCAs, PCBs, and multichip modules that warrant USML controls or completely remove paragraphs XI(c)(2&3). We further recommend revising paragraph XI(c)(1) to control electronic systems, sub-systems, parts or components not elsewhere specified that containUSML controlled software or an ASIC meeting the identified USML performance threshold.

Administrative:
We recommend revising USML Category XI(d) to remove reference to CCL ECCN 3C611 as that CCL entry does not exist.

Should clarification or subsequent technical discussions be necessary, please contact either Steve Headley at james.headley@ngc.com, (703-280-4806), or myself at thomas.p.donovan@ngc.com (703-280-4045).

Sincerely,

Thomas P. Donovan
Director, Export Management
Global Trade Management

April 13, 2018

U.S. Department of State
Directorate of Defense Trade Controls
PM / DDTC, SA-1 12th Floor
2401 E Street, NW
Washington, DC 20522
Via: www.regulations.gov

Subject: Raytheon Company Comments on USML Categories V, X, and XI
Ref: 83 Fed. Reg. 5970 (February 12, 2018)
Docket ID: DOS-2017-0017

On February 12, 2018, the Department of State, Directorate of Defense Trade Controls (DDTC) requested comments from the public to inform its review of United States Munitions List (USML) Categories V, X, and XI. DDTC requested comments on six topics related to these categories: (1) emerging technologies; (2) normal commercial use; (3) future commercial use; (4) drafting/technical issues; (5) Category XI(b) modification; and (6) potential cost savings for transitions from USML to CCL. Below please find comments from Raytheon.

I. USML Category V

In response to Topic 1 (emerging technologies), high temperature explosives are required in several emerging technologies such as hypersonics. With the increased velocities encountered in hypersonic applications, aerodynamic heating will generate extremely high temperatures on the surface of the vehicle. Energetics in current warhead formulations will thermally decompose when heated to the potential temperatures that may be encountered on a hypersonic vehicle if not heavily protected resulting in payload penalties. One potential solution is the development of extremely high-temperature stable materials that can withstand the severe thermal environment with little or no insulation required.

In response to Topic 3 (future commercial use), certain high temperature energetics will also likely have a commercial application for deep well and oil well completion applications. The commercial applications may develop or be developing energetics that may have crossover defense applications and should be monitored. The following are examples of some high temperature explosives that are currently on the USML and may have some commercial applications in the future: Categories V(a)(5) [CP]; V(a)(9) [DDPO or LLM-105]; V(a)(15) [HMX]; V(a)(17) [HNS]; V(a)(22) [PYX]; V(a)(25) [TATB]; and V(a)(36)(ix) [TACOT].

Recommendation 1: Add a new control to account for emerging high temperature explosives:

Category V(a)(39) "High temperature explosives and formulations thereof, not otherwise enumerated in this paragraph or on the CCL in ECCN 1C608, capable of withstanding 573 K (300 °C) [*suggested threshold*] without degradation of performance for a minimum of 10

minutes [*suggested threshold*] and with detonation velocity exceeding 6800 m/s or detonation pressure exceeding 18 GPa (180 kbar)."

Recommendation 2: Add a control for a high temperature explosive not currently covered under under USML Category VI(a): "NONA (2,2',2",4,4',4",6,6',6"-Nonanitro-m-terphenyl) (CAS 51460-84-5)"

In response to Topic 4 (drafting), we recommend that Category V(a)(9) be amended to include LLM-105, the common name of the controlled explosive. This change is consistent with other subparagraphs within Category V(a) which reference both the common and scientific names (*e.g.* Categories V(a)(1), V(a)(3), V(a)(12), etc.).

Recommendation 3: Add italicized language to Category V(a)(9): "DDPO (*LLM-105 or* 2,6-diamino-3,5-dinitropyrazine-1-oxide, PZO) (CAS 194486-77-6)."

II. USML Category XI(a)

Category XI(a)(3)(viii)

In response to Topic 4 (drafting), Category XI(a)(3)(viii) controls "Air surveillance radar with free space detection of 1 square meter RCS target at an altitude of 65,000 feet and an elevation angle greater than 20 degrees (i.e., counter-battery)."

However, it is not clear what the term "counter-battery" is intended to control. If the intention is to include any phased array air surveillance radar, then additional comments and clarifications are needed to avoid catching all forms of phased array radars with a range greater than ~11NM because the radar can be physically orientated to exceed the stated values.

Recommendation 4: Define "counter-battery" to explain the intent to capture such radars that are capable of performing this function in conjunction with a fire control system: "Is a radar system that detects artillery projectiles and from their trajectories locates the position on the ground of the weapon that fired it." Add sentence: "Radars that do not locate the position of ground based weapons systems are not covered by this section."

Category XI(a)(3)(ix)

In response to Topic 2 (normal commercial use), multiple elevation beams are now commonly available because of commercially available digital beamforming techniques and electronics known as RF Systems on a Chip (SoC). Controlling radars with multiple elevation beams includes modern AESA radars that are used for commercial air traffic control and weather observation. Additionally, these capabilities have become key to addressing the Multifunction Phased Array Radar (MPAR) goals led by National Oceanic and Atmospheric Association (NOAA), National Severe Storms Laboratory (NSSL), and other non-defense organizations. Internationally, these capabilities are widely studied, such as by Tor Vergata University in Italy.

There is no quantification of the level to which 3D height finding is acceptable, thereby controlling any Weather or Primary Surveillance Radars (PSR) with a beam that can estimate height. We recommend adding values that describe the level of accuracy or precision of a controlled air surveillance radar so as to not preclude a PSR with height finding capabilities. For example, beam width and refresh rate could be specified such that it would include a radar intended for defense purposes, *i.e.* a beam with of less than 0.5 degree in elevation and a refresh rate of less than 1 second. An example application is that ICAO requirements for a Precision Approach Radar (PAR) are such that beam width in elevation must be 0.6 degrees in elevation and have a refresh rate of less than 1 second. Multiple international manufactures produce such a radar, *e.g.* ELDIS PAR-E: *http://www.eldis.cz/en/par-e-precision-approach-radar*.

Additionally, in response to Topic 4 (drafting), this control could be less ambiguous by referencing a specific numeric threshold instead of the word "multiple." Dictionary definitions vary on whether "multiple" means more than one or more than two.

Recommendation 5: Change XI(a)(3)(ix) to "Air surveillance radar with ~~multiple~~ *more than two* elevation beams *of less than 0.5 deg in elevation and a refresh rate of less than 1 second*, phase or amplitude monopulse estimation, or 3D height-finding."

Category XI(a)(3)(xii)

Primary Surveillance Radars, Precision Approach Radars, and Phased Array Weather Radars

In response to Topic 2 (normal commercial use), U.S companies face a negative competitive impact by having Primary Surveillance Radars, Precision Approach Radars, and Weather radars controlled on the USML. These items do not have a defense purpose, are readily available internationally, and are available internationally at higher technology thresholds. Moreover, the trend in primary air traffic and weather surveillance is towards Active Electronic Scanned Array (AESA) technology. AESA technology uses solid state electronics to form a beam through phase shifting. It is currently controlled in subparagraphs XI(a)(3)(xii) and XI(c)(10)(i and ii). Non-U.S. companies are starting to develop and sell AESA-based Air Traffic Control (ATC) and weather sensors, which is eroding Raytheon's edge in the market.

Lesser controls on these technologies would enable the pursuit of safer, more cost effective air traffic and weather radar systems.

The current subparagraphs controlling PSR technology are XI(a)(3)(vii), XI(a)(3)(ix), XI(a)(3)(xvii)

There are several products designed, developed, and manufactured outside the U.S. that are not ITAR-controlled:

(a) Hensoldt "Datenblatter"
https://www.hensoldt.net/fileadmin/hensoldt/Datenblätter/0483_17_ASR-NG_civil_brochure_E_intranet.pdf

This radar can see a two square meter target to 120nmi. This scales to 100 nmi for a one square meter. The radar has multiple elevation beams that enable 3D height finding.

(b) Thales (France), STAR-NG
https://www.thalesgroup.com/sites/default/files/asset/document/star_ng_datasheet_final.pdf

This radar can see a one square meter target out to >90nmi.

(c) NRPL (Finland)
http://nrpl.aero/products/primary-surveillance-radar/

This radar can see a one square meter target out to 100nmi.

(d) ELDIS (Czech), PAR-E
http://www.eldis.cz/sites/default/files/par-e_2016_en.pdf

Performs Precision Approach Control (PAR).

(e) Toshiba Weather Radar
https://www.wmo.int/pages/prog/www/IMOP/publications/IOM-125_TECO_2016/Session_2/K2A_Wada_Toshiba.pdf

Uses patch arrays and similar approach as Raytheon's LPR system.

Similarly, phased array weather radars are increasingly more capable and support transmission at power levels greater than 250W. One example includes active research by University of Oklahoma to provide long range weather radar surveillance (available at https://arrc.ou.edu/radar_cppar.html). Increasing the peak TX power from 250 watts to 2000 watts would foster and enable unburdened research in this field.

Recommendation 6: Revise the note to Category XI(a)(3)(xii) to "NOTE TO PARAGRAPH (a)(3)(xii): This paragraph does not control radars not otherwise controlled in this subchapter, operating with a peak transmit power less than or equal to *2000* watts."

Recommendation 7: Control Primary Surveillance Radars, Precision Approach Radars, and Weather radars under Category 7 of the CCL.

Category XI(a)(3)(xvii)

In response to Topic 2 (normal commercial use), Pulse-Doppler processing of single filter in a weather radar software system can achieve simulated performance of more than 60 dB. Changing the control language would avoid controlling weather radars with software Doppler filtering that in a simulation can achieve greater than 60 dB.

Recommendation 8: Change language to: "Radar having moving target indicator (MTI) or pulse-Doppler processing where ~~any single Doppler filter~~ *the radar system* provides a normalized clutter attenuation of greater than 60dB:"

III. USML Category XI(b)

In response to Topic 5 (Category XI(b)), this category, as currently written, may control capabilities in normal commercial use.

Excluding Items within the scope of ECCNs 3A002.c.4, 5A001.f, and 5A980

Notwithstanding the current Order of Review construct, there is precedent for the USML's using ECCN descriptions to define the scope of the USML entry. That is, the USML paragraph still governs, but its scope description excludes by reference items that are otherwise described in an ECCN. Specifically, USML Category V(a)(38) controls "Explosives, not otherwise enumerated in this paragraph or on the CCL in ECCN 1C608, with a detonation velocity exceeding 8700 m/s at maximum density or a detonation pressure exceeding 34 Gpa (340 kbar)." ECCN 1C608 describes, using technical and other objective parameters, a list of explosives and related items. Similarly, ECCNs 3A002.c.4, 5A001.f, and 5A980 describe a list of electronic collection and related items using technical and other objective parameters. ECCN 3A002.c.4 controls specific signal analyzing equipment meeting various performance-based criteria. ECCN 5A001.f controls interception, jamming, and monitoring equipment that meet various criteria. ECCN 5A980 is a catch-all control for surreptitious interception devices not controlled by ECCN 5A001.f.1.

These ECCN are, by definition, commercial or dual-use items. As stated in the NOI's preamble, one of DDTC's goals is to ensure that the USML does not control commercial or dual-use items. Excluding items that are within the scope of these positively controlled CCL entries from the scope of XI(b) would be an efficient way of accomplishing this goal. Moreover, the ECCNs are controlled for National Security or Surreptitious Listening reasons. Thus, the government has the authority to control their export to destinations, end uses, and end users of concern.

Including Electronic Systems or Equipment Funded by the Defense Department or an Intelligence Agency

To the extent an item within the scope of one of the ECCNs (or any other item not described on the CCL) was funded, in whole or part, by the Defense Department or one of the intelligence agencies (unless otherwise designated as for fundamental research or dual use by the funding agency, such as DARPA), then the item would still be subject to the ITAR pursuant to broad new catch-all funding provision we suggest adding to XI(b)(4). This jurisdiction-by-funding construct was added to USML XI(a)(7) to control on the ITAR items where U.S. government funding was a key indicator that the item warranted the controls of the ITAR (unless declared otherwise in a Commodity Jurisdiction determination) but the ability to describe such items in a positive way was too difficult.

The same policy concerns that apply to XI(a)(7) developmental electronics apply to XI(b) intelligence electronics. We believe that such a broad control based on government funding alone is reasonable in this case given the inherent difficulty in describing in detail items of military application. To the extent such an item specially designed for intelligence purposes does not, however, warrant ITAR control, then it would be for the State Department, based on input from Defense and Commerce, to determine control on a case-by-case basis in commodity-specific Commodity Jurisdiction determinations.

Define "Specially Designed for Intelligence Purposes"

Although it is difficult to define the phrase "specially designed for intelligence purposes," we believe it is critical to do so because, without a definition, the term can be interpreted in ways that would capture items designed for and used for non-military, non-intelligence agency, non-government commercial intelligence or other information gathering. Thus, the phrase should be defined in a way that does not control items that are for commercial applications (unless funded by the Defense Department or an intelligence agency, as described above.) To the extent dual-use / commercial items are sensitive, then they would be described and controlled in the referenced ECCNs. The use of the word "uniquely" in our proposed definition (described below) would exclude dual-use/commercial items from XI(b)'s scope and the reference to electronic intelligence (ELINT) and signals intelligence (SIGNIT) would be precise enough given that they are terms of art well understood in the intelligence community.

Include in control articles specially designed for the extraction from, or analysis of, information from electromagnetic spectrum, and items designed to counter-act such equipment

Our proposed XI(b)(1), (2), and (3) subparagraphs are the essential content of the current XI(b). Our proposal is divided into three subparagraphs to make it more readable and re-worded slightly to describe what we believe the State Department's objective is in having such controls. For example, we believe that "extraction" is more precise because

many types of purely commercial power meters and frequency counters collect, survey, and monitor frequencies in the electromagnetic spectrum. We propose breaking out into a separate subparagraph the systems or equipment that analyze such information ((b)(2)) and then a separate third paragraph for the equipment to counter such systems or equipment ((b)(3)). This would make clear, and allow for easier jurisdictional analyses of, the three basic types of systems and equipment that are caught by the category.

Recommendation 9: Thus, to accomplish the national security objectives of USML XI(b) but without inadvertently controlling (or appearing to control) items in normal commercial use, we suggest revising the paragraph so that it reads as follows:

> (b) Electronic systems and equipment, not elsewhere enumerated in this subchapter or described in ECCNs 3A002.c.4, 5A001.f, or 5A980, specially designed for intelligence purposes, and
>
> (1) Specially designed for the extraction of voice, data, or metadata from a transmission using the electromagnetic spectrum (regardless of transmission medium);
>
> (2) Specially designed for analysis of voice, data, or metadata produced from an article described in XI(b)(1);
>
> (3) Specially designed for counteracting activities described in paragraphs XI(b)(1) or XI(b)(2); or
>
> (4) Funded by the Department of Defense or a U.S. Government intelligence agency via contract or other funding authorization.
>
> Note: "Specially designed for intelligence purposes" means equipment or systems developed with capabilities that are uniquely used by government military or non-military intelligence agencies for electronic intelligence (ELINT) and signals intelligence (SIGNIT) purposes and does not control per se all network packet analyzers, traffic loggers, and other general purpose systems or equipment that collect information from, survey, or monitor the electromagnetic spectrum.
>
> Note 1 to paragraph (b)(4): The paragraph does not control systems or equipment determined to be subject to the EAR via a commodity jurisdiction determination (see sec. 120.4 of this subchapter), or (b) identified in the relevant Defense Department or intelligence agency contract or other funding authorization as being developed for U.S. government intelligence and non-government (i.e., commercial) applications.

> Note 2 to paragraph (b)(4): Note 1 does not apply to defense articles enumerated or elsewhere described on the USML, whether in production or development.
>
> Note 3 to paragraph (b)(4): This paragraph is applicable only to those contracts and funding authorizations that are dated [two years after the effective date], or later.

IV. USML Category XI(c)-Printed Circuit Boards and Circuit Card Assemblies

In response to Topic 4 (drafting or other technical issues), Raytheon requests re-evaluation of Category XI(c) and Export Control Reform (ECR) FAQ #13 as pertain to Printed Circuit Boards (PCB) and Circuit Card Assemblies (CCA).

Raytheon follows Category XI and the Order of Review established for determining the jurisdiction and classification of Printed Circuit Boards (PCBs) and Circuit Card Assemblies (CCAs) as required by the revisions to the ITAR and EAR adopted during the previous Administration's Export Control Reform (ECR) effort. Determinations are aided by ECR FAQ #13, which DDTC has published on its website and states, in part:

> "The jurisdiction of a particular application-specific PCB is determined by the jurisdiction of the next higher-level functional assembly (NHFA) for which the PCB was specially designed (i.e., the jurisdiction of the item that drove the design requirements for the PCB in question)"
>
> AND
>
> "a PCB that is unique, specific, and directly related to the function and operation of the next higher level assembly (as opposed to the function and operation of the end item itself) would assume the same controls (i.e., jurisdiction) as those of the next higher assembly."

Based on its review of the ITAR and the EAR, and DDTC's ECR FAQ #13, Raytheon, with one exception, looks to the next higher *functional* assembly (NHFA) for which the layout of a PCB/CCA is designed when determining the jurisdictional status of the PCB/CCA. Thus, if the next higher assembly is, for example, merely housing or packaging for which the PCB/CCA provides no function, then its jurisdictional status is not factored into the jurisdictional analysis of the PCB/CCA. If the PCB/CCA provides a function to the next higher assembly, then it takes on the jurisdictional status of that assembly. This means that if the functional assembly is subject to the ITAR, then the CCA is controlled under XI(c)(2). If the functional assembly is a 600 series item subject to the EAR, then the CCA is controlled under 3A611.g.

The one exception pertains to situations where a CCA/PCB provides an explicitly enumerated capability that is elsewhere described on the USML, such as a CCA that is also a

Transmit/Receive module controlled under XI(c)(4). In such cases, that USML category governs based on the order of review. The mere presence of software loaded on subcomponents of a CCA, however, does not factor into the analysis if the software is not performing an explicitly enumerated capability in the USML.

Gap in Regulatory Language

Though Cat. XI(c)(2), the Note thereto, and the FAQ appear to be clear in regards to the Order of Review, there appears to be a gap in the regulatory language as pertain to 600-series CCAs/PCBs with ITAR-controlled software or subcomponents.

Recommendations 10-13: In order to ensure consistent and compliant application of the Order of Review for CCAs/PCBs under Category XI, Raytheon recommends the following:

- Incorporate the language of the FAQ directly into Category XI;

- Specifically state that an ITAR component embedded on a 600-series CCA/PCB will not change the classification of the NHFA unless it is designed to function directly with the higher level defense article or is directly related to the function of a higher level ITAR-controlled assembly or the defense article itself.
    - If that ITAR component or software only functions with the NHFA, then it will assume that NHFA's classification.

- Add a definition for "next higher-level functional assembly" such as:
  (a) *Next higher-level functional assembly* of a lower-level part or component (see §120.45) is a system which contains both the function (see §120.41) of the lower-level part or component and additional functions beyond minor packaging. Merely adding housing, connectors, wiring, or similar minor packaging does not constitute the creation of a "functional assembly".

  (b) *Next higher-level functional assembly* of an accessory or attachment is the system with which the accessory or attachment interacts.

- Add a common industry abbreviation for "circuit card assembly" to USML Category XI(c)(2) during these updates. Recommended changes are in underlined text:
  Printed Circuit Boards (PCBs) and populated circuit card assemblies (CCAs) for which the layout is specially designed for a next higher-level functional assembly (see §120.52) that is controlled in this subchapter;

  Note to paragraph (c)(2): PCBs and populated CCAs for which the layout is specially designed for a next higher-level functional assembly that is a 600 series item are controlled in ECCN 3A611.g.

V. USML Category XI(c) – Other

Category XI(c)(1) and XI(c)(3) - Application Specific Integrated Circuits (ASICs) and Programmable Logic Devices (PLD)

Paragraph (c)(1) and (c)(3) have the same issue as (c)(2) except no DDTC FAQ clarification exists. The comments distinguishing 3A611.g and XI(c)(2) should, logically, apply to 3A611.f / XI(c)(1) and 3A611.h / XI(c)(3).

Recommendation 14: Raytheon proposes similar changes to address XI(c)(1) and XI(c)(3) in order to align it with XI(c)(2). Our proposed changes are in italics below:

(1) Application Specific Integrated Circuits (ASICs) and Programmable Logic Devices (PLD) programmed for *a next higher-level functional assembly (see §120.52) that is controlled* in this subchapter;

> Note 1 to paragraph (c)(1): An ASIC is an integrated circuit developed and produced for a specific application or function regardless of number of customers.
>
> Note 2 to paragraph (c)(1): ASICs and PLDs programmed *for a next higher-level functional assembly that is a 600 series item* controlled in ECCN 3A611.f.
> Note 3 to paragraph (c)(1): Unprogrammed PLDs are not controlled by this paragraph.

(3) Multichip modules for which the pattern or layout is specially designed for *a next higher-level functional assembly (see §120.52) that is controlled* in this subchapter;

> Note to paragraph (c)(3): Multichip modules for which the pattern or layout is specially designed for *a next higher-level functional assembly that is a 600 series item* are controlled in ECCN 3A611.h.

Raytheon also proposes adding the recommended definition for "next higher-level assembly" to §120.52 as described in our above comment to XI(c)(2).

Category XI(c)(4)

This category over-controls Monolithic Microwave Integrated Circuits (MMIC) that are low power (<5W), have narrow bandwidth, and are designed/built for commercial applications, such as weather radars or low power ATC radars. As a result, the USML is in conflict with the Wassenaar controls as incorporated into the CCL at 3A001. Note that the CCL now requires all of the criteria be met to control the MMIC.

For example, consider these two test cases that would be caught by current USML and how they would be treated under revised rules:

1. X-band single channel T/R module => CONTROLLED BY 3A001.b.12
Power > 5W => FAIL
Bandwitdth 40% => FAIL
Size = 1cm x 2.5cm => FAIL
Phase shifter = yes => FAIL

2. X-band 4 channel T/R MMIC => EAR-99
Power = 0.03W => PASS
Bandwitdth 40% => FAIL
Size = 7mm x 7mm => FAIL
Phase shifter = yes => FAIL

The impact to removal of the requirements in the USML will eliminate the conflict in controlling requirement as noted above. If the intent of the USML is to control small, high power, wide bandwidth MMICs, the USML language should be re-written to catch those components which exceed thresholds described in the CCL. The CCL would not need to be amended. In this case, the CCL is ahead of the USML and enables U.S. companies to compete internationally.

Recommendation 15: Delete the controls in Category XI(c)(4) and control on the Commerce Control List through ECCN 3A001.

Raytheon appreciates the ability to comment through this process, and thanks you for your partnership.

* * *

RESEARCH ELECTRONICS INTL.

April 9, 2018

Sent via email to: DDTCPublicComments@state.gov

Directorate of Defense Trade Controls
Office of Defense Trade Controls Policy
U.S. Department of State
Washington, DC 20522-0112

RE: Docket Number DOS–2017–0017 – Request for Comments Regarding Review of USML Categories V, X and XI (RIN 1400–AE46)

Dear Sir or Madam:

Research Electronics International LLC ("REI"), located at 455 Security Drive, Cookeville, TN 38506, is pleased to have the opportunity to provide comments on the International Traffic in Arms Regulations: USML Category XI, Military Electronics.

REI's comments were coordinated and discussed with other industry representatives who will submit their comments regarding Category XI(b) independently. However, it is important to note that there is general industry agreement with the comments submitted below.

REI designs, manufactures, and sells commercial of the shelf (COTS) electronic test equipment that is used primarily in the security industry by Corporations, Law Enforcement, and Government agencies. While REI did have a single product that was ITAR, currently, all REI products are subject to the jurisdiction of the Export Administration Regulations (EAR) and described in Categories 3 and 5 of the Commerce Control List (CCL).

It is our opinion that the current ITAR Category XI(b) could easily be interpreted to capture items designed for commercial use. The current functional characteristics identified in Category XI(b) are ambiguous at best. Several of the subparagraphs of the USML overlap with existing controls on the CCL. Our comments are intended to assist the DDTC in its effort to revise the category to, as described in the NOI, ensure that it and other USML categories do not describe items in normal commercial use. We also realize the inherent difficulties in describing items specially designed for non-commercial intelligence purposes. After a description of the ECCNs that address many of the same policy concerns of USML category XI(b), we provide suggested text using more positive, structured paragraphs, a general control with U.S.-government funded items similar to the catch in USML XI(a)(7), and a definition of "specially designed for intelligence purposes."

RESEARCH ELECTRONICS INTL.

I. Comments regarding USML Category XI paragraph (b) modification

U.S. Munitions List category XI(b) controls:

> *(b) Electronic systems, equipment or software, not elsewhere enumerated in this subchapter, specially designed for intelligence purposes that collect, survey, monitor, or exploit, or analyze and produce information from, the electromagnetic spectrum (regardless of transmission medium), or for counteracting such activities.*

Existing ECCNs that Address Policy Objectives of USML XI(b)

Before suggesting changes to XI(b), we would like to provide the DDTC a list of CCL entries which may overlap with Category XI(b).

a. **ECCN 3A002.c.4** captures certain signal analyzing equipment using performance-based criteria:

3A002.c.4 "Signal analyzers" having all of the following:

a. "Real-time bandwidth" exceeding 170 MHz; and
b. Having any of the following:
b.1. 100% probability of discovery, with less than a 3 dB reduction from full amplitude due to gaps or windowing effects, of signals having a duration of 15 µs or less; or
b.2. A "frequency mask trigger" function, with 100% probability of trigger (capture) for signals having a duration of 15 µs or less;

Technical Notes:
1. Probability of discovery in 3A002.c.4.b.1 is also referred to as probability of intercept or probability of capture.

2. For the purposes of 3A002.c.4.b.1, the duration for 100% probability of discovery is equivalent to the minimum signal duration necessary for the specified level measurement uncertainty.

Note: 3A002.c.4 does not apply to those "signal analyzers" using only constant percentage bandwidth filters (also known as octave or fractional octave filters).

Items captured by ECCN 3A002.c.4 are subject to National Security controls of the EAR and license exception LVS applies for exports less than $5,000. We believe that COTS signal analyzers that meet or exceed the control thresholds of this entry would not be "specially designed for intelligence purposes" and thus would not be controlled by the ITAR.

b. **ECCN 5A001.f** of the CCL broadly captures interception or jamming, and monitoring equipment:

5A001.f Mobile telecommunications interception or jamming equipment, and monitoring equipment therefor, as follows, and "specially designed" "components" therefor:

1. Interception equipment designed for the extraction of voice or data, transmitted over the air interface;
2. Interception equipment not specified in 5A001.f.1, designed for the extraction of client device or subscriber identifiers (e.g., IMSI, TIMSI or IMEI), signaling, or other metadata transmitted over the air interface;
3. Jamming equipment "specially designed" or modified to intentionally and selectively interfere with, deny, inhibit, degrade or seduce mobile telecommunication services and performing any of the following:

a. Simulate the functions of Radio Access Network (RAN) equipment;
b. Detect and exploit specific characteristics of the mobile telecommunications protocol employed (e.g., GSM); or
c. Exploit specific characteristics of the mobile telecommunications protocol employed (e.g., GSM);

4. Radio Frequency (RF) monitoring equipment designed or modified to identify the operation of items specified in 5A001.f.1, 5A001.f.2 or 5A001.f.3.

Note: 5A001.f.1 and 5A001.f.2 do not apply to any of the following:
a. Equipment "specially designed" for the interception of analog Private Mobile Radio (PMR), IEEE 802.11 WLAN;
b. Equipment designed for mobile telecommunications network operators; or
c. Equipment designed for the "development" or "production" of mobile telecommunications equipment or systems.

N.B. 1: See also the International Traffic in Arms Regulations (ITAR) (22 CFR parts 120-130). For items specified by 5A001.f.1 (including as previously specified by 5A001.i), see also5A980 and the U.S. Munitions List (22 CFR part 121).
N.B. 2: For radio receivers see 5A001.b.5.

Items captured by ECCN 5A001.f.1 are subject to Surreptitious Listening controls and to *Nota Bene* 1. N.B. 1 requires the exporter to consider reviewing the controls of the USML. Here, too, the EAR contains Related Control guidance to refer to the ITAR (USML Cat XI(a)(4)(iii) for certain electronic attack and jamming equipment). We consider this overlap to be instructive, and therefore, we are going to utilize the language in 5A001.f.1 when considering how to revise the structure of XI(b).

Items captured by ECCN 5A001.f.2, 5A001.f.3, and 5A001.f.4 are subject to National Security controls of the EAR. License exception LVS applies to ECCN 5A001.f.2 and 5A001.f.4 where exports are less than $5,000. License exceptions GBS and CIV apply to ECCN 5A001.f.2, 5A001.f.3, and 5A001.f.4. As noted before, license exception CIV applies to exports to civilian end-uses and GBS applies to exports to countries in country group B. The EAR Related Controls guidance applies to these ECCN subparagraphs as well.

c. **ECCN 5A980** is related to 5A001.f.1 and is intended to be a catch-all for surreptitious interception devices not controlled by 5A001.f.1:

5A980 Devices primarily useful for the surreptitious interception of wire, oral, or electronic communications, other than those controlled under 5A001.f.1; and "parts," "components" and "accessories" therefor.

Similar to items captured by ECCN 5A001.f.1, we believe that there could be overlap between 5A980 and the USML, and that the exporter would need to request a CJ for items potentially captured in ECCN 5A980. Should the CJ determine the item was subject to the jurisdiction of the ITAR, the result of the CJ would most likely be to classify the item in XI(b).

Suggested Edits to USML XI(b)

After a review of the above ECCNs, we believe Category XI(b) captures items already controlled by ECCNs in 3A002 and 5A001. Therefore, our suggested revisions will try to draw out differences to ensure the exporter is able to determine whether an item is subject to the EAR or to the ITAR.

As a first step, we would recommend the DDTC restructure the text using practices common to multilateral control regimes, such as the Wassenaar Arrangement, to ensure the conjunctions used in Category XI(b) clearly isolate functions requiring the conjunction "AND" from those requiring "OR."

Secondly, while clarifying the use of "AND" and "OR" in Category XI(b) will certainly help the exporter determine jurisdiction, we believe additional clarity is needed to capture the intent of several phrases used in XI(b); those phrases are:

1. *for intelligence* purposes

It's our opinion the phrase *for intelligence purposes* is critical because it intentionally narrows the capture of XI(b) to those items specially designed for the intelligence agencies of the US Government. Therefore, we will attempt to use the header of XI(b) as a broad capture, with specific requirements outlined in 4 subheadings. We have also leveraged text used in XI(a)(7) to specifically call for items funded by a government agency to be captured.

Therefore, we would request that the term "specifically designed for intelligence purposes" be defined. A suggested definition is:

Note: "Specially designed for intelligence purposes" means equipment or systems developed capabilities that are uniquely used by government military and non-military intelligence agencies for electronic intelligence (ELINT) and signals intelligence (SIGNIT) purposes and does not control per se all network packet analyzers, traffic loggers, and other general purpose tools for collecting, surveying, or monitoring the electromagnetic spectrum.

2. *Collects, surveys, monitors*

These terms are not defined in the ITAR and without definitions we must rely on generally accepted definitions by the industry. For example, general purpose signal analyzers, whether or not classified in

ECCN 3A002.c.4, and various types of power meters and frequency counters subject to the US Export Administration Regulations can collect, survey or monitor frequencies of the electromagnetic spectrum. We believe the focus should be on the phrase *produce information from* and have suggested removing the terms *collects, surveys, and monitors*.

3. *produce information from*

We believe the phrase *produce information from* intends to describe functionality that would allow a user to extract data (e.g. voice, data or metadata) from a transmission and believe the language from 5A001.f.1 is more suitable to described this action. We also believe post processing of voice, data, or metadata may be carried out by a separate item. Therefore, we recommend splitting the extraction and analysis functions into 2 separate subheadings.

4. Carve-out for items described in overlapping ECCNs

As described above, the items n ECCNS 3A002.c., 5A001.f, and 5A980 overlap with possible readings of USML XI(b). We realize the general jurisdictional "order of review rule," but suggest a novel, simple solution of simply excluding from the scope of XI(b) any items described in this entries. The U.S. government would still control the items (and related software and technology) for export and reexport, but exporters would have a bright jurisdictional line for knowing the jurisdictional status of their products. To compensate for the possible EAR control of items funded by the U.S. Government, an additional catch would be added to XI(b) for articles funded by the U.S. Government. This catch would follow the same structure as XI(a)(7).

Based on the points above, we have proposed an alternative revision for consideration:

> *(b) Electronic systems, equipment or software, not elsewhere enumerated in this subchapter or described in ECCNs 3A002.c.4, 5A001.f, or 5A980, specially designed for intelligence purposes, and being any of the following:*
>
> *(1) Specially designed for the extraction of voice, data or metadata from a transmission using the electromagnetic spectrum (regardless of transmission medium);*
>
> *(2) Specially designed for analysis of voice, data or metadata produce from an item described in XI(b)(1);*
>
> *(3) Specially designed for counteracting activities described in XI(b)(1) or XI(b)(2); or*
>
> *(4) Funded by the Department of Defense via contract or other funding authorization*

Finally, we believe that the notes from Category XI(a)(7) are also directly applicable to Category XI(b)(4). But, we suggest a minor edit to Note 1 part (c) to clarify that this note is referring to equipment that was intentionally developed as dual use. We recommend reordering the wording in this note as indicated and underlined below, and that this note be updated in both XI(a)(7) and XI(b)(4).

Note 1 to paragraph (b)(4): This paragraph does not control electronic systems or equipment (a) in production, (b) determined to be subject to the EAR via a commodity jurisdiction determination (see §120.4 of this subchapter), or (c) identified as being developed for both civil and military applications either in the relevant Department of Defense contract or other funding authorization mechanisms.

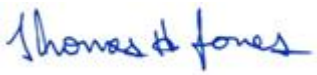
Note 2 to paragraph (b)(4): Note 1 does not apply to defense articles enumerated on the USML, whether in production or development.

Note 3 to paragraph (b)(4): This paragraph is applicable only to those contracts and funding authorizations that are dated July 1, 2015, or later.

IV. Conclusion

Thank you for the opportunity to provide comments on Category XI. I hope that our input is useful and seriously considered. Please contact me by e-mail at tom@reiusa.net or call 931 537 6032 should the DDTC have any additional questions concerning this letter.

Respectfully submitted,



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April 12, 2018

Office of Defense Trade Controls Policy
US Department of State

VIA email DDTCPublicComments@state.gov

Re: Docket Number DOS-2017-0017
Request for Comments Regarding Review of USML Categories V, X and XI

Dear Sir/Madam,

Please accept these comments relative to Category X, specifically, Category X(a)(7) and Category X(d) relative to (a)(7) parts. Our comments regard drafting or other technical issues in the text of the language that now exists. It is respectively requested that the existing language be amended to afford greater clarity to intended coverage and thereby eliminate unintended coverage of laser protective technology that is otherwise commercially and commonly available.

It is recommended that "narrowband" be better defined in Category X(a)(7). Also, it would be beneficial to further define values for visible light transmittance to more clearly define what is worthy of protection and remove eyewear that offers little to no tactical benefit at night or in low light conditions. Finally, it is recommended that Category X(d), relative to parts and components of Category X(a)(7) be further modified to eliminate the unintended consequence of regulating dyes that do not have laser protective uses.

It is suggested that the language be changed as follows:

Category X—Personal Protective Equipment
(a) Personal protective equipment, as follows:

****

(7) Goggles, spectacles, visors, vision blocks, canopies, or filters for optical sights or viewers~~,~~:

(i)utilizing more than one distinct narrowband laser protective band with an optical density greater than 3, where narrowband is defined as having a bandwidth of less than 25nm when measured at the half height of its peak, ~~employing other than common broadband absorptive dyes or UV inhibitors as a means of protection (e.g., narrow-band filters/dyes or broadband limiters/coatings with high visible transparency), having an optical density greater than 3,~~ and that protect against:
~~(i)~~(A) Multiple visible narrowband ranges of ~~(in-band)~~ laser wavelengths; or
~~(ii)~~(B) Thermal flashes associated with nuclear detonations; ~~or~~
~~(iii) Near infrared or ultraviolet (out-of-band) laser wavelengths; or~~

(ii) protecting against near infrared or ultraviolet (out-of-band) laser wavelengths provided there is an optical density greater than 3, a visible light transmittance greater than 75%, and utilization of other than common ultraviolet absorbers;

Note 1 to paragraph (a)(7): *See* paragraphs (d)(2) and (3) of this category for controls on related parts, components, and materials.
Note 2 to paragraph (a)(7): *See* USML Category XII for sensor protection equipment.

****

(d) Parts, components, assemblies, accessories, attachments, and associated equipment for the personal protective equipment controlled in this category, as follows:

****

(3) Materials and coatings specially designed for the articles covered in paragraph (a)(7) of this category with optical density greater than 3, as follows:
(i) Narrowband absorbing dyes specially designed for use in narrowband protective bands;

****

We thank you for your consideration of these amendments to the existing language.

Sincerely,

Gregory Maguire
Sr. Director, Legal and Government Affairs

Duane Raper
Sr. Product Classification Specialist
Export and Import Compliance
Office of General Counsel
400 Collins Road NE
Cedar Rapids, IA 52498

Richard Koelling
Acting Director, Office of Defense Trade Controls Policy
Bureau of Political-Military Affairs
U.S. Department of State
Washington, DC

Re: Docket Number DOS–2017–0017
Request for Comments Regarding Review of USML Categories V, X and XI.

Rockwell Collins appreciates the opportunity to provide comments on USML Category XI.

I. Corporate Background and Interest in Category XI

Rockwell Collins, Inc. is a leader in the design, production and support of communications and aviation electronics for commercial and military customers worldwide. While our products and systems are primarily focused on aviation applications, our Government Systems business also offers products and systems for ground and shipboard applications. The integrated system solutions and
products we provide to our served markets are oriented around a set of core competencies: communications, navigation, automated flight control, displays/surveillance, simulation and training, integrated electronics and information management systems. We also provide a wide range of services and support to our customers through a worldwide network of service centers, including equipment repair and overhaul, service parts, field service engineering, training, technical information services and aftermarket used equipment sales.
Given the majority of Rockwell Collins defense products are captured within Category XI of the USML we are very much interested in helping to define and clarify any items captured in this category as well as to contribute to the understanding of any items that were once military specific that are now becoming more & more commercially used.

II. Comments

1) Category XI(A)(1)(v) enumerates Underwater hardware, equipment, or systems for Low Frequency/Very Low Frequency (LF/VLF) electronic modems, routers, interfaces, and communications equipment, specially designed for submarine communications. Rockwell Collins designs, develops and produces LF/VLF equipment and systems for airborne platforms such as trailing wire antenna systems as well as ground based platforms that are intended to communicate with submarines, but are not specifically used in underwater platforms. We are unclear as to whether or not the intention of Category XI(A)(1)(v) is to capture this type of equipment regardless of the platform it is used on, or if our airborne and ground based LF/VLF systems are intended to be captured in CAT XI(A)(5)(i). We would suggest the addition of a note to CAT XI(A)(1)(v) stating that all LF/VLF equipment, including airborne and ground stations, used for submarine communications should be captured in CAT XI(A)(1)(v) if the intention is to capture all LF/VLF systems in that subparagraph.

2) Category XI(A)(5)(i) enumerates C3, C4 and C4ISR systems or equipment that is specially designed to integrate, incorporate, network, or employ defense articles that are controlled in paragraphs or subparagraphs of the categories of §121.1 of this part that do not use the term specially designed. The term 'Employ' is not specifically defined in the USML, and may cause confusion based on the interpretation of the term 'Employ'. The Websters dictionary gives three definitions for the term 'Employ'; 1) to make use of someone or something, 2) to use something advantageously, or 3) to engage the services of something. We believe the intention of Cat XI(A)(5)(i) with regards to 'employ defense articles….' is to capture items that 'make use' of defense articles. Using the later definition of 'engage the services of….' could capture items that simply turn on or change the settings a defense article such as a remote switch panel or tuning panel that simply set discrete signals to turn on or change settings a defense article, but do not make use of that defense article. Historically, the performance and function of remote switch panels and tuning panels have not warranted an SME designation such as CAT XI(A)(5)(i). We feel either re-wording the subparagraph to state "make use of functionality" instead of "employ" would reduce or remove any possible confusion. The addition of a note citing specific examples of intended items to be captured in Cat XI(A)(5)(i) would also be helpful.

3) Category XI(A)(11) enumerates Test sets specially designed for testing defense articles controlled in paragraphs (a)(3), (a)(4), (a)(5), or (b). The term 'Test Sets' is not specifically defined in the USML, and could be interpreted in various ways. One interpretation could be that a Test Set is an item that is complete and ready to test the defense article. Items such as specially designed adapter modules and test panels that are parts and components of a test solution, but are not complete and ready to test a defense article on their own would therefore not be captured using this interpretation of 'Test Set'. We believe a note to paragraph XI(A)(11) clarifying the term 'Test Sets' and stating if specially designed parts and components are also captured would solidify the intention of this subparagraph.

4) Category XI(C)(2) enumerates Printed Circuit Boards (PCBs) and populated circuit card assemblies for which the layout is specially designed for defense articles in this subchapter. Category XI(C)(3) enumerates Multichip modules for which the pattern or layout is specially designed for defense articles in this subchapter. The term 'Layout' is not specifically defined in the USML and may cause confusion. The Webster's dictionary definition of 'Layout' is 1) the plan or design or arrangement of something. Using this definition of 'Layout' could lead someone to capture only PCBs or multichip modules based on their physical arrangement of parts, components, circuit paths and traces but not based on their functionality (ex: an ECCM capable modem card and a commercial modem card, both having the same physical layout of traces and component pads, but the commercial modem card is missing all of the ECCM specific components). Clarification of the term "Layout" by citing specific examples of PCBs and multichip modules intended to be captured in this subparagraph would help ensure accurate classification. In addition to clarifying the term 'Layout', the addition of a note worded similarly to the note listed in the EAR classification of 3A611 would also clarify the items intended to be capture in this subparagraph. The note in 3A611 reads "When applying the "specially designed" definition to determine whether a printed circuit board, populated circuit card assembly or multichip module is controlled by this entry, the layout of the board or assembly and the pattern and layout of the module are the only characteristics that need be evaluated under the "specially designed" definition."

5) Category XI(C)(18) enumerates Parts, components, or accessories specially designed for an information assurance/information security system or radio controlled in this subchapter that modify its published properties. Examples given for published properties in the subparagraph are frequency range, algorithms, waveforms, CODECs, or modulation/demodulation schemes. The statement "modify its published properties" is not clear and could be misinterpreted. The examples given in the subparagraph are clearly functions and properties of an information assurance/information security system or radio controlled in this subchapter, but what is meant by 'modify' is unclear. For example, the frequency range, available waveforms, and available modulation/demodulation schemes of a radio are finite in nature, and the design of the radio limits these properties to a specific range of available options. One potential interpretation of 'modify its published properties' could be 'to control or switch or choose' properties such as frequency range, waveforms and modulation schemes within the available options and limits of the radios design. This interpretation would capture items such as radio tuning and control units that command the radio to change frequency or turn on/off ECCM waveforms, or switch modulation schemes, or control encryption algorithms. If this is the intended interpretation of 'modify published properties', perhaps changing 'modify' to 'control' or 'manipulate' would make the intention of this subparagraph more concise. Citing examples of the types of items intended to be captured in this subparagraph would also be helpful.

6) Category XI(A)(5)(iv) enumerates C3, C4 and C4ISR systems or equipment that are specially designed rated, certified, or otherwise specified or described to be in compliance with U.S. government NSTISSAM TEMPEST 1-92 standards or CNSSAM TEMPEST 01-02. "Parts" are not included in the main heading of this subparagraph. We would like some clarification as to whether the intention of this subparagraph is to capture parts that are specially designed to contribute to meeting TEMPEST requirements. Items such as a radio chassis that was designed with tuned RF cavities, or made from special materials to allow the end item to meet TEMPEST requirements. We would suggest a note in subparagraph (iv) that states whether or not parts are captured in CAT XI(A)(5)(iv) or in the CCL 600 series.

7) Category XI (A)(7) enumerates developmental electronic equipment or systems funded by the Department of Defense via contract or other funding authorization . Currently, our Advanced Technology Center (ATC) has many programs that are funded by DARPA, which would be captured by this subparagraph. Some of the technology being developed by our ATC under these DARPA funded programs have dual use or civil/commercial applications, and should be able to be released based on Note 1 to paragraph (a)(7) if the DARPA contract stated that the technology was being developed for both civil and military applications. Unfortunately, DARPA usually does not include that verbiage in their contracts, and when questioned as to the reason, their explanation is that they do not feel they should make those decisions as to whether a technology has a civil use or not. This leaves all of these types of development programs in an ITAR classification until they go into production, or until we write a commodity jurisdiction and receive a reply. Our ATC engineering teams would like to see CAT XI(A)(7) reworded to include 'specially designed' for a military application in order to resolve this issue.

8) Category XI (C)(4) enumerates Transmit/receive modules or transmit modules that have any two perpendicular sides, with either length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [$d \leq 15cm*GHz/fGHz$], with an electronically variable phase shifter or phasers that are a Monolithic Microwave Integrated Circuit (MMIC), or incorporate a MMIC or discrete RF power transistor. This subparagraph does not contain the wording 'specially designed for defense articles in this subchapter'. Currently, we produce transmit specific modules that include phase shifters that are captured in this subparagraph as it is currently worded. These modules are used in both military applications as well as commercial applications such as weather radar and SATCOM phased arrays. We believe that items such as commercial 5G wireless base stations would also contain modules that could be captured in this subparagraph as it is currently worded. We believe re-wording this subparagraph to include "specially designed for a military application" would allow us to release commercially used modules from ITAR control. Alternatively, if there was wording added to specify a certain power or linearity range (ex: 'output power greater than 10W operating in frequency band X') this would also allow commercial items to fall out of ITAR control.

9) Category XI (C)(10) enumerates Antennas, and specially designed parts and components therefor, that: (i) Employ four or more elements, electronically steer angular beams, independently steer angular nulls, create angular nulls with a null depth greater than 20 dB, and achieve a beam switching speed faster than 50 milliseconds; (ii) Form adaptive null attenuation greater than 35 dB with convergence time less than one second; (iii) Detect signals across multiple RF bands with matched left hand and right hand spiral antenna elements for determination of signal polarization; or (iv) Determine signal angle of arrival less than two degrees (e.g., interferometer antenna). This subparagraph does not contain the wording 'specially designed for defense articles in this subchapter' currently. We believe it may be a benefit for future developments in antenna technologies to include 'specially designed for defense articles in this subchapter' in this subparagraph to allow commercial items to fall out of ITAR control. Our engineering teams are developing antenna technologies where they would be independently steering angular nulls for weather radar applications as well as SATCOM phased array applications. Such antenna systems would be used with commercial weather radar to suppress ground clutter caused by wind shear events and runway imaging. These antennas systems could also be used with SATCOM systems to mitigate adjacent satellite interference. Including the 'specially designed for defense articles' wording in this subparagraph would allow these currently developing types of antenna systems to fall out of ITAR control.

III. Conclusion

We believe the proposed changes related to the nine subparagraphs outlined above would help clarify the understanding and intentions of those subparagraphs, and ensure accurate classification of our Category XI products. We also feel that newly developing technologies in areas such as Weather Radar, SATCOM, and 5G communications could potentially capture commercially used items in an ITAR category.

Rockwell Collins is fully committed to supporting the Administration's efforts in improving the clarity and understanding of the USML Category XI. We greatly appreciate the opportunity to provide comments on this topic.

Thank You and Best Regards,

Duane Raper
Sr Regulatory Compliance Specialist
Rockwell Collins, Inc.

SEMICONDUCTOR INDUSTRY ASSOCIATION

April 13, 2018

Submitted via email to: DDTCPublicComments@state.gov
Submitted via www.regulations.gov

Ms. Engda Wubneh
Office of Defense Trade Controls Policy
Department of State
2401 E St., NW
Washington, D.C. 20037

Re: Notice of Inquiry; Request for Comments Regarding Review of United States Munitions List Categories V, X, and XI (Federal Register Notice of February 12, 2018; RIN 1400-AE46)

Dear Ms. Wubneh:

The Semiconductor Industry Association (SIA) is the voice of the U.S. semiconductor industry, one of America's top exporting industries and a key driver of America's economic strength, national security and global competitiveness. Semiconductors – microchips that control all modern electronics – enable the systems and products we use to work, communicate, travel, entertain, harness energy, treat illness and make new scientific discoveries.

The semiconductor industry directly employs nearly 250,000 people in the United States. In 2017, U.S. semiconductor company sales totaled $189 billion – roughly half the global market share – and semiconductors are the foundation of the trillion-dollar global electronics industry. SIA seeks to strengthen U.S. leadership in semiconductor manufacturing, design and research by working with Congress, the Administration, and other key stakeholders to encourage policies and regulations that fuel innovation and drive international competition.

SIA is pleased to submit the following comments in response to the request for comments to inform the State Department's review of the controls implemented in recent revisions to Category XI of the United States Munitions List (USML).

I. Introduction and Background

SIA strongly supported the Department's efforts setting forth revisions for 18 USML categories to create positive lists of controlled items using objective criteria and, with limited exceptions, to eschew the use of subjective criteria and catch-all phrases to control unspecified items. We agree that a more positive list can and should be tailored to satisfy the national security and foreign policy objectives of the U.S. Government by controlling defense articles that provide a critical military advantage, without

inadvertently controlling items in normal commercial use. Finally, SIA supports the Department's continuing efforts to regularly revise and update the International Traffic in Arms Regulations (ITAR) to account for technological developments and continue to ensure that the ITAR do not control semiconductors, and related technology and other items, in or soon to become in normal commercial use.

II. Evolution of 5G Networks and Systems

The primary area of concern to SIA where revisions to the USML XI are now and will be needed over the next several years pertains to fifth-generation (5G) mobile networks. Mobile network operators in the U.S. and foreign nations have ambitious plans to establish 5G networks in the immediate future. The advantages of 5G include much higher data rates and system capacity, reduced latency, and massive device connectivity. 5G systems are needed to provide richer and faster content to mobile phones and other devices, to enable the Internet of Things, and to enable the high data rates and low latency needed for connected and autonomous vehicles to meet specifications.

In the U.S., each of the major mobile network operators have announced plans for the deployment of 5G networks in 2018. AT&T has announced plans for portable 5G hotspot service in twelve U.S. cities by the end of 2018. Verizon will launch fixed 5G service in three to five cities in 2018, with 5G smartphones and networks by early 2019. T-Mobile plans to have 5G in thirty cities by the end of 2018, and a nationwide mobile network by 2020. Sprint has announced plans for 5G-like service in six U.S. cities.

Foreign mobile operators have also announced plans for the deployment of 5G networks. Korea Telecom launched a 5G pilot program during the 2018 Winter Olympics and plans a nationwide roll out in late 2019. In Japan, NTT DOCOMO, Japan's largest mobile operator, announced plans for a 5G mobile network in commercial service by 2020. China Mobile will launch a trial network in four large Chinese cities, and smaller trials in twelve other cities, in 2018. In Russia, telecom operators MegaFon and Rostelecom have signed a cooperation agreement to jointly develop a 5G network, and MegaFon will have 5G test zones in Moscow and St. Petersburg during the 2018 World Cup. In total, there are twenty-two operators in sixteen countries currently committed to deploying 5G according to the Global Mobile Suppliers Association (GSMA).

The GSMA expects 5G connections to reach 1.1 billion, or 12% of total mobile connections, by 2025. 5G will infuse data center, edge computing, networks, modems and IP. The global semiconductor industry totaled $400 billion in sales in 2017. Communications currently accounts for over 30 percent of sales by end use, with computers and servers close behind at 30 percent. Consumer and automotive are each above 10 percent. All of these segments – comprising over 80 percent of total sales – will become 5G-enabled. SIA member companies must participate in the development of this technology to maintain our leadership position in the global semiconductor market.

III. ITAR Controls are Incompatible with Global Electronics Supply Chains

Because semiconductors are components in hardware for 5G systems, semiconductor companies must work with the providers of such hardware well in advance of system deployment to ensure American semiconductor products and technology are used in the 5G systems of the future. Developers and vendors of this purely commercial wireless technology will not partner with U.S. semiconductor companies if their items and activities are subject to the military controls of the ITAR. This is a basic fact of commercial life in all sectors – non-U.S. companies will almost never agree to allow their commercial products be subject to extra-territorial military export controls of the United States. They will generally choose suppliers from other allied countries, such as South Korea, Japan, and those in the European Union, where such military controls do not exist over components for 5G systems. These countries have a general rule that components not specially designed for military systems are not subject to their munitions controls.

To be clear, SIA is not objecting to export controls over sensitive dual-use components that are used in 5G systems. Indeed, SIA and its member companies consider themselves partners with the U.S. Government in keeping the descriptions of such sensitive dual-use components correct and current so that they can be properly controlled by the United States and its dual-use multilateral regime allies. Rather, SIA and its member companies will provide information regularly to the U.S. Government regarding the evolution of 5G systems and networks to ensure that such purely commercial applications are not subject to the ITAR. If regular updates are not made over the years, SIA companies will fall far behind international competitors in the development and commercialization of this significant emerging civilian technology – a market worth hundreds of billions of dollars worldwide. This would significantly reduce our ability to keep high-technology manufacturing and export-led employment in the United States.

IV. Specific Comments

For business proprietary reasons, SIA members will be submitting their own comments to the U.S. Government pertaining to their products in normal commercial use that are or might be within the scope of a USML paragraph. U.S. semiconductor companies are currently marketing their solutions to manufacturers of 5G mobile devices and infrastructure components. With fierce competition between members to have their semiconductor products and solutions incorporated into hardware for this extremely commercially significant, yet still burgeoning market, companies are very reluctant to publicly disclose details of their technology, sales and products to competitors. Thus, SIA, for now, is making only the following two general comments about two Category XI subparagraphs. We and our member companies then look forward to reviewing the proposed rule to help ensure that any proposed changes would not inadvertently capture commercial 5G and other networks and systems.

A. USML XI(c)(4)

USML Category XI(c)(4) controls "Transmit/receive modules or transmit modules that have any two perpendicular sides, with either length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [d≤15cm*GHz/f GHz], with an electronically variable phase shifter or phasers that are a Monolithic Microwave Integrated Circuit (MMIC), or incorporate a MMIC or discrete RF power transistor."

High-bandwidth frequency ranges under development for 5G are roughly 25 GHz, 40 GHz, 60 GHz, and 75 GHz. Though the highest two bands may or may not ultimately be used, they are under active development in the United States and abroad. At these frequencies, phased-array antennas are the only practical antennas for transmitting or receiving. Fundamental physics dictates that the antenna elements must be spaced less than one-half wavelength apart. One-half wavelength is 15 cm divided by the operating frequency in GHz, exactly the control threshold. Since transmission-line or waveguide losses are extremely high at these frequencies, the transmit and receive electronics must be located immediately next to the antenna elements and therefore themselves be less than one-half wavelength in size in order to fit within the available space. Thus, category XI(c)(4) controls the electronics for all 5G antenna systems.

Modules caught by Category XI(c)(4) may or may not meet the control parameters of ECCN 3A001.b.12 depending on their rated operating frequencies, power and bandwidth. ECCN 3A001.b.12 is a relatively new ECCN. With Wassenaar Arrangement Member States' consensus, the Commerce Department created this ECCN in 2017 to consolidate the old and new controls for the types of MMICs also controlled by Category XI(c)(4). *See* 82 Fed. Reg. 38766 (Aug. 15, 2017). Such a change, we understand, occurred after a technical analysis and policy agreement among the departments of Defense, Commerce, and State that some MMICs of the same type as those controlled by Category XI(c)(4) should not be on either the Wassenaar Munitions List or the Dual-Use List if they fell below the power and bandwidth parameters in the new ECCN.

It is our understanding that the U.S. Government is aware of this issue and plans to remedy it with a change to USML Category XI(c)(4) so that it includes peak saturated power output parameters that exceed those described under ECCN 3A001.b.12, along with other changes to resolve the overlap between the USML and CCL. We nonetheless make this comment to preserve the point – and to encourage the U.S. Government to promptly implement the fix in order to help ensure continued leadership by U.S. companies.

B. USML XI(c)(10)

USML Category XI(c)(10) controls "Antennas, and specially designed parts and components therefor, that:

> (i) Employ four or more elements, electronically steer angular beams, independently steer angular nulls, create angular nulls with a null depth greater than 20 dB, and achieve a beam switching speed faster than 50 milliseconds;
>
> (ii) Form adaptive null attenuation greater than 35 dB with convergence time less than one second;
>
> (iii) Detect signals across multiple RF bands with matched left hand and right hand spiral antenna elements for determination of signal polarization; or
>
> (iv) Determine signal angle of arrival less than two degrees (e.g., interferometer antenna)."

A note to the paragraph states that it does not control Traffic Collision Avoidance Systems (TCAS) equipment conforming to FAA TSO C-119c. There are no notes stating that it does not apply to commercial 5G applications, although we do not believe that it was the intention of the U.S. Government to apply USML controls to items in civil telecommunications applications.

However, null-steering antenna satisfying subparagraphs (i) and (ii) may be required in 5G infrastructure (e.g., base stations, mobile stations, and transportable stations) in order to avoid interference with neighboring 5G infrastructure and from large nearby metal objects. Also, angular resolution of subparagraph (iv) may be required to locate individual handsets. Therefore, this entry will apply to 5G cellular infrastructure within the next five years.

As a practical matter, as described above and elsewhere, U.S. industry cannot participate in the international market with such items subject to ITAR control. The risk of potential military controls over purely commercial applications discourages foreign partners in allied countries from participating with U.S. businesses. Furthermore, due to the incompatibility of ITAR controls with global electronics supply chains for civilian applications, no U.S. manufacturer we know of would knowingly build systems that are within the scope of an ITAR paragraph for a civil application. Thus, we do not have examples of specific civilian products that meet the standards in XI(c)(10).

We do, however, know that it is a reasonable possibility that, within the next five years, 5G infrastructure operators will need to have the flexibility to take appropriate action to resolve purely commercial 5G antenna issues without the possibility of control under USML XI(c)(10). Although we are willing to discuss other ideas with the U.S. Government to resolve this issue, one simple solution would be to limit the scope of the paragraph to only those articles that are "specially designed for defense articles." We

appreciate that the State Department generally wants to limit the use of "specially designed" control parameters in favor of more positive descriptions. However, in situations where positive list parameters would be too unwieldy or elusive, State has occasionally used such solutions. They still tailor the control to specific articles but ensure that dual-use items are properly subject to the controls of the Export Administration Regulations (EAR) rather than the ITAR. State, working with its Defense and Commerce colleagues, can ensure that dual-use antennae that are not specially designed for defense articles but are nonetheless sensitive have the proper reasons for control attached to them in the bookend Commerce Control List entry.

V. Conclusion

SIA supports the Department's efforts to revise the USML to ensure it does not cover items in normal commercial use, and we look forward to submitting robust, detailed comments on a future proposed rule. If you have any questions regarding these comments or the issues in general, please do not hesitate to contact me at 202-446-1713 or jpasetti@semiconductors.org.

Sincerely yours,

Joseph Pasetti
Senior Director, Government Affairs
Semiconductor Industry Association

Department of State Notice of Inquiry:
Request for Comments Regarding Review of United States Munitions List Categories V, X, and XI (RIN 1400-AE46)

Comments of the Small UAV Coalition –
Request for Revision of U.S. Munitions List Category XI(a)(3)(i)

Filed via email to DDTCPublicComments@state.gov, DOS-2017-0017

The undersigned, on behalf of the Small UAV Coalition ("Coalition")[1] submits these comments in response to the Federal Register notice published on February 12, 2018, 80 Fed. Reg. 5970.

The Coalition supports the Department's objective of establishing a positive U.S. Munitions List ("USML") under the International Traffic in Arms Regulations ("ITAR," 22 C.F.R. Parts 120-130) that "uses technical parameters and descriptions" to reduce jurisdictional confusion, and to "control on the USML only those items that provide at least a significant military or intelligence applicability."[2] The Coalition is providing these comments, consistent with the Department's stated objective, because USML Category XI(a)(3)(i) does not currently include any specific technical parameters regarding airborne radar systems it controls. The Coalition believes the lack of such parameters unnecessarily restricts U.S. development of small Unmanned Aircraft Systems ("UAS") incorporating airborne radar systems that do not provide a significant military or intelligence applicability.

The Coalition proposes that Category XI(a)(3)(i) be amended to exclude airborne radar systems with a range no greater than 8 kilometers, angular resolution no less (better) than 2 degrees, and/or target refresh rate no greater (faster) than 1 Hz. These revisions would not implicate any militarily sensitive capability or undermine U.S. national security, but would enable U.S. civil UAS manufacturers and operators to incorporate short-range collision avoidance radar in their civil UAS, thereby promoting U.S. competitiveness in an emergent technology sector while delivering

[1] A list of the Small UAV Coalition members is available at http://www.smalluavcoalition.org/members/.

[2] Remarks of Assistant Secretary Kevin Wolf at Update 2011 Conference (Jul. 19, 2011), https://bis.doc.gov/index.php/policy-guidance/encryption/94-about-bis/newsroom/speeches/speeches-2011/383-remarks-of-assistant-secretary-kevin-wolf-at-update-2011-conference.

important benefits for safety and utility across a range of U.S. industries and activities.

I. The Small UAV Coalition

The Coalition is a partnership of leading American consumer and technology companies with a demonstrated history and interest in applying UAS technological advancements to benefit consumers. We believe a proper regulatory and policy environment can encourage the growth of the UAS industry and benefit the economy by creating jobs and encouraging increased economic activity. As American companies with a global footprint, we believe the United States should lead technological innovation in the industry and set the global benchmark for operational safety. Towards that end, the Coalition strongly encourages development of a regulatory and policy environment that permits the safe operation of small UAS within and beyond the line of sight, and with varying degrees of autonomy, for commercial, consumer, recreational and philanthropic purposes.

II. The Coalition's Interest in USML Cat. XI(a)(3)

Category XI-Military Electronics includes:

(a) Electronic equipment and systems not included in Category XII of the U.S. Munitions List, as follows:

(3) Radar systems and equipment, as follows:

(i) Airborne radar that maintains positional state of an object or objects of interest, other than weather phenomena, in a received radar signal through time.

While this control parameter is seemingly intended to cover target tracking radars on missiles and military aircraft, its breadth also captures much less sophisticated airborne radars that are not designed for military use but can be used by small civil UAS for collision avoidance in flight and landing operations.[3]

[3] The ITAR does not define the phrases "maintains positional state" nor "a received radar signal through time." This ambiguity has created confusion as to the performance parameters that distinguish an airborne radar system subject to the ITAR from those currently controlled under Export Control Classification Number ("ECCN") 6A008.e. The lack of objective parameters has also resulted in the Department's control of airborne radar systems that are designed for commercial uses and are not suited for military-specific applications. Such regulatory confusion is contrary to the

These short-range radars provide no critical military or intelligence advantage. Therefore, under the criteria established in ITAR § 120.3(a), they should not be ITAR-controlled. Because they provide no military-specific functionality, subjecting these non-military UAS radars to ITAR control provides no discernable national security benefit. In fact, it may weaken U.S. national security by stifling innovation in an important technology sector. Unnecessarily limiting UAS manufacturers in the ability to enhance their sense-and-avoid systems with such collision avoidance radar could encourage investment by our strategic competitors and potentially deny or diminish the benefits of autonomous civil UAS to a range of American industries and industry participants. For these reasons, the Coalition firmly supports excluding such radars from USML Cat. XI(a)(3)(i) and controlling them instead under an appropriate category of the Commerce Control List in the Export Administration Regulations ("EAR," 15 C.F.R. Parts 730-774).

III. The Evolving UAS Industry and Its Benefits for Safety, Utility and Competition

The global UAS industry has expanded and evolved dramatically in recent years. The value of the global industry for UAS solutions has been estimated at more than $127 billion. UAS are already being used by the tens of thousands by hobbyists and commercial operators for an array of tasks, including aerial photography and videography, entertainment, site inspection, industrial operations monitoring, pipeline survey, mapping, fishing and fishery management, disaster recovery, search and rescue, and agricultural tasks such as applying fertilizer or monitoring crops.

Possibilities for civil UAS applications in the next several years go much further, particularly if they can operate autonomously and beyond line-of-sight. Autonomous UAS promise significant improvements to safety, capability and cost in a range of civil applications including humanitarian assistance, firefighting, logistics and package delivery, medical support, weather monitoring, wildlife management and similar applications. In addition, with appropriate regulatory controls, UAS development can be a significant source of technical innovation for the U.S. economy, and provide an important advantage for the United States in related

spirit of the Export Control Reform Initiative, and unnecessarily burdens U.S. manufacturers who are dependent upon the radar technology for the development of safe civil UAS with broad commercial utility.

emerging technologies, including, for example, telecommunications, mobile robotics and autonomous vehicles.

IV. Continued ITAR Control of Airborne Collision Avoidance Radar Is Limiting Development of the U.S. UAS Industry

While the expanding industry for autonomous civil UAS promises important benefits, current USML controls over airborne radar put U.S. leadership in this sector at risk. Growth of the U.S. UAS industry depends on the adoption of robust and redundant technologies for safe operation within the National Airspace System. The safe operation of UAS beyond an operator's line-of-sight depends on UAS's ability to autonomously sense and avoid potential collision hazards both in flight and during landing. For small UAS, airborne collision avoidance radar is currently one of the most promising solutions for this potentially critical capability.

Continued ITAR control over airborne collision avoidance radar could effectively deter U.S. manufacturers and operators of civil UAS from incorporating that technology into their products and operations. The ITAR compliance programs, employment controls, export authorizations, end-use provisions and retransfer restrictions necessitated for ITAR-controlled products would make civil use not viable. Rather than incurring the investment, restrictions and risks associated with managing ITAR controls, as a practical matter, many in the U.S. civil UAS industry would exclude collision avoidance radar technologies, thereby losing out on its benefits and potentially undermining U.S. competitiveness in this important sector.

The U.S. commercial satellite industry's history illustrates how crippling ITAR restrictions can be for civil industries. U.S. satellite manufacturers held approximately 75 percent of the global commercial communications satellite industry in 1998 when Congress shifted satellites to the USML. Over the next decade, U.S. manufacturers dropped to 30 percent of the industry, lost an estimated $21 billion in revenue to their European and Asian competitors, and shed approximately 9,000 jobs. While there were many contributing factors, participants in the U.S. commercial satellite industry have indicated that overly broad ITAR restrictions contributed to this significant opportunity loss for the United States. The continued control of airborne collision avoidance radar, as well as other technologies important to the autonomous civil UAS industry, could have a similar effect on the

U.S. UAS sector, and could surrender leadership in this emerging industry to foreign competitors.

V. Airborne Collision Avoidance Radar Is Not Militarily Sensitive

USML Cat. XI(a)(3)(i) seeks to control military tracking radars used by missiles and military aircraft to track and/or intercept a moving target. Airborne collision avoidance radar systems do not provide these capabilities, any equivalent performance capability, or any other critical military or intelligence advantage. Indeed, within the technical parameters proposed by the Coalition below, airborne collision avoidance radar has few, if any, military applications.

The Coalition proposes three technical parameters to distinguish airborne collision avoidance radars with no applicability to the high-performance military tracking radars that Cat. XI(a)(3)(i) is intended to control:

1. Range – no greater than 8 kilometers;
2. Angular resolution – no less (better) than 2 degrees; or
3. Target refresh rate – no greater (faster) than 1 Hz.

Radar conforming to these technical parameters would fall well below the performance capabilities needed for military-specific applications, but would be sufficient for small UAS use for "sense and avoid" during flight and landing.

Range:
In order for airborne tracking radar to be militarily useful against the range and speed of engagement of modern weapons and weapons platforms, they must be able to detect moving targets from hundreds of kilometers away. In order for airborne tracking radar to be useful in civil applications (*e.g.*, to sense and avoid birds and aircraft at relatively slow speeds and low altitudes, as well as obstacles during the landing process), a detection range as limited as 8 kilometers is more than adequate. While much larger detection ranges should be satisfactory to distinguish between civil and military airborne tracking radar, an 8 kilometer limit range is well below what would be useful in military applications.

Angular Resolution:

Because of the distances, speeds, and stakes involved, military airborne tracking and targeting radar must be able to resolve targets at small angular resolutions. Resolving military targets from 100 kilometers away would generally require angular resolutions much less (better) than 2 degrees. However, an angular resolution of 2 degrees would be perfectly adequate for a small UAS seeking to avoid obstacles in flight or landing. Precise positioning information for the object is not needed if the UAS's protocols direct it to steer well clear of any object presenting a collision risk.

Tracking Update Rate:
Military airborne targeting and tracking radar needs to track fast-moving, agile targets with high precision. That can only happen if the radar sweeps the target frequently. By contrast, the typical collision threats for small civil UAS include birds, low-flying aircraft, animals, people and ground-based objects. These threats are relatively slow moving, so a radar refresh rate of 1 Hz, corresponding to one radar interrogation of the environment every second, would provide an acceptable radar map of the UAS's surroundings for the purpose of avoiding collision with such slow moving objects.

Meeting any one of the range, resolution or refresh rate exclusion parameters above renders a radar system unfit for anything specific to a military application. The Coalition therefore suggests that USML Cat. XI(a)(3)(i) be revised to exclude radar that meet any one of the exclusion parameters. For example, a radar would be excluded from ITAR control under USML Cat. XI(a)(3)(i) if it had a range of less than 8 kilometers, even if its angular resolution was less (better) than 2 degrees and its tracking update rate was greater (faster) than 1 Hz.[4]

VI. Proposed Change to USML Cat. XI(a)(3)(i)

Pursuant to its position above, the Coalition respectfully requests that DDTC update USML Category XI(a)(3)(i) to exclude airborne radars meeting the above technical parameters. The proposed revision to Cat. XI(a)(3)(i) would read as follows:

[4] The Coalition notes that the technical parameters suggested above fall well short of the carve-out provided for automotive sense-and-avoid technologies issued in 2013. Prior to that change, USML Cat. XI(a)(3) encompassed all radar systems with search, acquisition and tracking capabilities, regardless of range, power or sensitivity. In July of 2013, the U.S. Government agreed that automobile collision avoidance systems did not provide a critical military or intelligence advantage, and shifted such systems to the EAR. The fact that collision avoidance radar for the auto industry does not merit ITAR control strongly suggests that similar radar for the civil UAS industry also does not merit ITAR control.

> *Airborne radar that maintains positional state of an object or objects of interest, other than weather phenomena, in a received radar signal through time, other than airborne radar meeting any of the following criteria: with a range no greater than 8 kilometers; an angular resolution no less (better) than 2 degrees; or a target refresh rate no greater (faster) than 1 Hz.*[5]

The Coalition believes this proposed regulatory change clearly defines the technical parameters of airborne radar that is excluded from control under the ITAR. However, the Coalition stands ready to support the relevant U.S. Government agencies in refining the technical parameters for this exclusion if that would be helpful.[6]

VII. Conclusion

Small unmanned aircraft systems promise to improve safety and utility across a range of industries and activities, and offer an opportunity for U.S. leadership in an important technology industry. That promise should not be artificially constrained by unnecessary ITAR control over airborne collision avoidance radars with no appreciable military or intelligence capability. The Coalition therefore respectfully requests that USML Cat. XI(a)(3)(i) be modified as proposed above to exclude such radars from ITAR control.

[5] DDTC could alternatively add a note that states the following: Note to paragraph (a)(3)(i): This paragraph does not control radars not otherwise controlled in this subchapter, designed with a range no greater than 8 kilometers, an angular resolution no less (better) than 2 degrees, or a target refresh rate no greater (faster) than 1 Hz.

[6] The Coalition notes that any airborne radar system excluded from the USML as a result of this change would still be subject to EAR controls, most likely under Category 6 of the Commerce Control List.

SPACEX

April 9, 2018

Submitted via email to: DDTCPublicComments@state.gov

Richard Koelling
Acting Director, Office of Defense Trade Controls Policy
Bureau of Political-Military Affairs
United States Department of State

Re: Response to Notice of Inquiry, Request for Comments Regarding Review of United States Munitions List Categories V, X, and XI

Dear Mr. Koelling:

SpaceX submits the following comment in response to the State Department's request for comments regarding United States Munitions List ("USML") Categories V, X, and XI. *See* 83 Fed. Reg. 5970 (February 12, 2018). SpaceX's comment specifically relates to a suggested modification and improvement to Category XI. We appreciate the opportunity to provide this comment.

SpaceX

SpaceX was founded in 2002 to revolutionize space technology and today employs approximately 6,000 people throughout the United States. It designs, manufactures, launches, and operates advanced space launch vehicles and spacecraft for both commercial and government customers. SpaceX is also in the early stages of designing and developing a constellation of non-geostationary satellites that it will operate in connection with a new business to provide global satellite-based internet services. SpaceX is headquartered in Hawthorne, California and maintains a test facility in McGregor, Texas, launch facilities at Cape Canaveral, Florida and Vandenberg Air Force Base, California, and satellite design facilities in Redmond, Washington and Irvine, California. SpaceX also maintains offices in Houston, Texas, Chantilly, Virginia, and Washington, DC.

Comment: Category XI(c)(4) should be revised because it overlaps with the Commerce Control List (CCL) and describes items in normal commercial use

USML Category XI(c)(4) should be revised to include specific peak saturated power output parameters that are higher than the power parameters described under Export Control Classification Number ("ECCN") 3A001.b.12 under the Export Administration Regulations ("EAR"). In its present form, Category XI(c)(4) is capturing transmit modules incorporating Monolithic Microwave Integrated Circuit ("MMIC") used in everyday commercial applications, including the next generation of 5G phased array antennas. As such, companies that work in and with 5G technology are being subjected to the strict export requirements of the ITAR, rather than

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the commercial requirements of the EAR. The continued leadership of the United States in the telecommunications industry is contingent on the ability of U.S. companies to use 5G technology to compete globally.

USML Category XI(c)(4) currently controls:

> Transmit/receive modules or transmit modules that have any two perpendicular sides, with either length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [d≤15cm*GHz/fGHz], with an electronically variable phase shifter or phasers that are a Monolithic Microwave Integrated Circuit (MMIC), or incorporate a MMIC or discrete RF power transistor.

Modules caught by Category XI(c)(4) do not meet the control parameters of ECCN 3A001.b.12. In particular, transmit modules described under ECCN 3A001.b.12 overlap with items captured under USML Category XI(c)(4), but the EAR includes additional parameters that account for power and bandwidth that are not included within the USML description:

> b.12. 'Transmit/receive modules,' 'transmit/receive MMICs,' 'transmit modules,' and 'transmit MMICs,' rated for operation at frequencies above 2.7 GHz and having all of the following:
>
> > b.12.a. A peak saturated power output (in watts), Psat, greater than 505.62 divided by the maximum operating frequency (in GHz) squared [Psat > 505.62 W * GHz2/fGHz2] for any channel;
> >
> > b.12.b. A "fractional bandwidth" of 5% or greater for any channel;
> >
> > b.12.c. Any planar side with length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [d ≤ 15cm * GHz * N/fGHz] where N is the number of transmit or transmit/receive channels; and
> >
> > b.12.d. An electronically variable phase shifter per channel.

The result is a complete overtaking of ECCN 3A001.b.12 by USML Category XI(c)(4). This nullification of the ECCN conflicts with the intent of the revised USML and CCL that: the lists should be 'tiered' consistent with the criteria the U.S. Government is establishing to distinguish the types of items that should be controlled at different levels for different types of destinations, end uses, and end-users" and there should be a 'bright line' between the two lists to clarify jurisdictional determinations and reduce government and industry uncertainty about whether particular items are subject to the jurisdiction of the ITAR or the EAR[.]" *See* 75 Fed. Reg. 76930 (Dec. 10, 2010).

ECCN 3A001.b.12 is a relatively new ECCN. Subject to Wassenaar Arrangement Member States consensus, the Commerce Department created this ECCN in 2017 to consolidate the old and new controls for the types of MMICs also controlled by Category XI(c)(4). *See* 82 Fed. Reg. 38766 (Aug. 15, 2017). Such a change could have only occurred after a technical analysis and

policy agreement among the departments of Defense, Commerce, and State that MMICs of the same type as those controlled by Category XI(c)(4) should not be on either the Wassenaar Munitions List or the Dual-Use List if they fell below the power and bandwidth parameters in the new ECCN. Accordingly, their removal from ITAR-control is consistent with the interagency agreement that led to the changes to the relevant ECCN.

For your reference, the Wassenaar text, which is consistent with the relevant EAR but not ITAR controls, reads as follows:

> Transmit/receive modules', 'transmit/receive MMICs', 'transmit modules', and 'transmit MMICs', rated for operation at frequencies above 2.7 GHz and having all of the following: a. A peak saturated power output (in watts), Psat, greater than 505.62 divided by the maximum operating frequency (in GHz) squared [Psat>505.62 W*GHz2/fGHz 2] for any channel; b. A "fractional bandwidth" of 5% or greater for any channel; c. Any planar side with length d (in cm) equal to or less than 15 divided by the lowest operating frequency in GHz [d ≤ 15cm*GHz*N/fGHz] where N is the number of transmit or transmit/receive channels; and d. An electronically variable phase shifter per channel.

Wassenaar Arrangement, Public Documents Vol. II, *List of Dual-Use Goods and Technologies and Munitions List* (Dec. 2017).

Thus, USML Category XI(c)(4) should be updated to include specific peak saturated power output parameters that are higher than the power parameters described under ECCN 3A001.b.12 to resolve the overlap between the USML and CCL, provide consistency between them, align with the Wassenaar Arrangement, and prevent the capture of commercial items by the USML that are essential to continued U.S. leadership in the telecommunications industry.

Conclusion

SpaceX sincerely appreciates the work of the Administration to remove unnecessary regulatory burdens associated with the critically important controls on the export of military, dual-use, and other items warranting control. We are willing to work with the Administration in this highly complex and technical area to refine, support, and implement these and other export control reform suggestions. Please do not hesitate to contact us if you would like further detail or commentary on any of these issues.

Sincerely yours,

Sheila McCorkle
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Export Compliance Officer
(202) 649-2714
Sheila.McCorkle@spacex.com

April 12, 2018

Mr. Richard Koelling
Acting Director
Office of Defense Trade Controls Policy
Department of State
Washington, DC

Subject: Docket Number DOS-2017-Request for Comments Regarding Review of USML Categories V, X and XI (RIN: 1400-AE46).

Dear Mr. Koelling:

SRC, Inc., and its wholly owned subsidiaries, appreciate the opportunity to comment. Our comments focus on Category XI and RADAR technology.

International Controls

Under the Wassenaar Arrangement 2D radars and 3D radars with height-finding capabilities are controlled in a range of paragraphs found in Category 6 of the Dual-Use list. Further implementation of the Wassenaar Arrangement under Annex I of the European Dual-Use Goods List and Australia's Defence and Strategic Goods List identify radars as dual-use items under dual-use Category 6 – Sensors and Lasers.

However, under U.S. controls radars with 3D height-finding capabilities are broadly captured in USML Category XI(a)(3)(ix) and 2D radars that meet foreign customer requirements are limited by Category XI(a)(3)(xvii). There seems to be a large disparity of controls between the US and other Wassenaar Arrangement members and implementing countries.

Note: Export Administration Regulations (EAR) Commerce Control List (CCL) are already aligned with the Wassenaar Arrangement and account for radar related technologies in Category 6.

Availability

Radars competing internationally.

2D Radars	
Manufacturer	**Product**
Airbus Defence and Space (Cassidian)	Spexer 1000
FLIR Systems, Inc.	R20SS
FLIR Systems, Inc.	R6SS
Thales Electronic Systems GMBH	Ground Observer 12
Blighter® Surveillance Systems Ltd	B402
IAI ELTA Systems Ltd.	ELM-2112

3D Radars	
Manufacturer	**Product**
RADA Electronic Industries Ltd	RPS-42
Aveillant Ltd	Gamekeeper
Fortem Technologies, Inc.	TrueView*
IAI ELTA Systems Ltd.	EL/M-2129
Echodyne, Inc.	MESA-SSR
SaaB AB	GIRAFFE 1X
Robin Radar Systems BV	ELVIRA®

*TruView is a US radar with 3D capability controlled under 6A008 per CJ Determination Dated 6/15/2017.

Commercial and Non-military Use

With increasing commercial, agricultural, and industrial adoption of Unmanned Aerial Systems (UAS), the public is looking for ways to take full advantage of the technology's capabilities. Today, many users

are limited by line-of-site restrictions. Private UAS use is also creating security issues for borders, prisons, business campuses, amusement parks, filming locations, and event centers. Radars are a part of solving the line-of-site issues experienced by today's users. Radars can also provide information that can be used to build a case against unauthorized operation. Both UAS integration and security markets require radar systems with 3-D height finding to discern UAS from objects on the ground. As the UAS have become smaller in size, clutter attenuation in excess of 60 dB is often required for reliable detection. Systems that steer in azimuth and elevation are needed to provide sufficient angular coverage for short range uses.

The cost of compliance hinders adoption of radar due to constraints on persons who can operate and maintain the equipment, and therefore constrains the beneficial uses of UAS in commercial, agricultural and industrial applications while failing to promote airspace safety and security. The current ITAR controls disadvantage U.S. organizations, preventing them from being able to compete in international markets. Many foreign competitors have appeared in the marketplace and are able to make drastic improvements in their radar technology because they can participate easily in these markets.

Category Changes

Based on the broader commercial needs, SRC recommends the following changes. SRC believes that these changes balance the needs of the commercial community while considering the interests of national security.

- Recommend removal of paragraph XI(a)(3)(**ix**), "(ix) Air surveillance radar with multiple elevation beams, phase or amplitude monopulse estimation, or 3D height-finding." There are more specific categories within XI(a)(3) that capture radar that have either a specific military purpose or performs at levels that would indicate a specific military use. If this category can't be removed, a range de-control is suggested, "Note to paragraph (a)(3)(ix): This paragraph does not control radar systems that have a maximum detection range, for a 1 square meter target, of 25 nmi or less."

- Recommend removal of paragraph XI(a)(3)(**xii**), "(xii) Radar incorporating pulsed operation with electronics steering of transmit beam in elevation and azimuth." The category is overly broad for a technology widely available internationally. If this category cannot be removed, a range de-control is suggested, "Note to paragraph (a)(3)(xii): This paragraph does not control radar systems that have a maximum detection range, for a 1 square meter target, of 25 nmi or less."

- Recommend adding a de-control note and increasing the clutter attenuation to paragraph XI(a)(3)(**xvii**),

  > (xvii) Radar having moving target indicator (MTI) or pulse-Doppler processing where any single Doppler filter provides a normalized clutter attenuation of greater than 60dB;
  >
  > Note to paragraph (a)(3)(xvii): Normalized clutter attenuation is defined as the reduction in the power level of received distributed clutter when normalized to the thermal noise level.

  The range de-control suggested is, "Note to paragraph (a)(3)(xvii): This paragraph does not control radar systems that have a maximum detection range, for a 1 square meter target, of 25 nmi or less."

Category Clarification

The scope of what is included in XI(a)(5)(i) needs clarification.

*(5) Command, control, and communications (C3); command, control, communications, and computers (C4); command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR); and identification systems or equipment, that:

(i) Are specially designed to integrate, incorporate, network, or employ defense articles that are controlled in paragraphs or subparagraphs of the categories of §121.1 of this part that do not use the term specially designed;

Propose making this a stand-alone paragraph instead of a subparagraph to capture system of systems technology that may not be captured by government programs involving C3, C4, or C4ISR.

(6) Equipment, systems, or end items that are specially designed to integrate, incorporate, network, or employ defense articles that are controlled in paragraphs or subparagraphs of the categories of §121.1 of this part that do not use the term specially designed

If you have any questions or would like to discuss any of the comments, contact me at 315-883-4174 or acapria@srcinc.com. Thank you for considering these comments.

Sincerely,

Adam Capria
Senior Analyst, International Trade Controls

USML Category XI Wording Suggestions

The current USML XI(a)(3)(i) reads as follows: "**Airborne radar that maintains positional state of an object or objects of interest, other than weather phenomena, in a received radar signal through time.**" This entry is exceedingly broad and thus captures weather radar with limited tracking accuracy and limited range that should normally be subject to the Export Administration Regulations and only controlled for AT-1 purposes.

Entry lacks details concerning "airborne radar" and "objects of interest"

The current version of USML XI(a)(3)(i) controls "airborne radar" with tracking capability. As there is no definition of airborne radar, based on a plain reading of the term, it would seem Search and Rescue/weather radars used on aircraft but which track only limited objects in the ocean would appear to be captured by this term.[1] However, Telephonics submits that, based on the context and the features of the other entries in Category XI(a)(3), the drafters actually intended to capture only airborne radar that feature aerial tracking capabilities. Telephonics notes that USML XI(a)(3)(i) fails to define the type of "objects of interest other than weather phenomena" to, for example, **airborne** objects of interest. To address these deficits, Telephonics suggests the following:

> **Suggested Wording #1**
> Airborne radar that maintains positional state of an ***airborne*** object or objects of interest, other than weather phenomena, in a received radar signal through time
>
> **Suggested Wording #2**
> Airborne radar that maintains positional state of an ***airborne or ground*** object or objects of interest, other than weather phenomena, in a received radar signal through time

Entry lacks any technical parameters

The current wording of XI(a)(3)(i) also fails to include a power aperture range or other technical thresholds as is found in the other entries in XI(a)(3). As a result of the lack of technical thresholds, the current USML XI(a)(3)(i) unintentionally captures all radar with tracking capacity found on

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[1] Telephonics RDR-1700A is a lightweight X-band weather avoidance radar system designed and marketed for use on fixed or rotary wing aircraft engaged in maritime patrol, surveillance, rescue missions, and terrain mapping. Prior to Export Control Reform, the RDR1700A radar was subject only to the lowest levels of control on the Export Administration Regulations ("EAR"), AT-1 controls. However, post-ECR, the Department of State determined that the radar was controlled under XI(a)(3)(i) as it has tracking capability (albeit limited) which allows it to "maintain positional state of an object or objects of interest, other than weather phenomena, in a received radar signal through time."

aircraft, even those with limited tracking accuracy and severely limited range capability and accuracy (e.g., such as those unable to differentiate between targets that are close together, unable to track small objects, or provide any altitude information on targets.) Telephonics notes that, under the current USML XI(a)(3)(v), ship-based radar systems with tracking capacity, but which have power aperture of less than 50 Wm^2, are not controlled under the ITAR[2]. For example, although one of Telephonics' search and rescue weather radars is nearly identical to commercial ship-based radars (except that its housing has not been designed for the harsher environment of the sea and except that its interface has been designed for use on an aircraft), it is captured under XI(a)(3)(i) because it has a limited ability to track objects other than weather phenomena over time (such as small boats located in the ocean, which is exactly what a comparable non-ITAR ship-based radar would track).[3] Telephonics respectfully submits that this broad reach is contrary to the goals of Export Control Reform and can be addressed by the inclusion of technical parameters. As such, we propose the following wording revision:

Suggested Wording #3

Airborne radar that maintains positional state of an object or objects of interest, other than weather phenomena, in a received radar signal through time with an average power aperture product of greater than 50 Wm^2.

[2] Category XI(a)(3)(v) controls "ocean surveillance radar with an average power aperture product of greater than 50 Wm2"

[3] The Telephonics search and rescue weather radar does not have the capacity to track ground-based or air-based objects or small objects in the water such as periscopes. It has a power threshold of a little less than 1/50th of that cited in XI(a)(3)(v), as well as a range accuracy (i.e., the uncertainty in the measurement of the distance of an object) and a range resolution (i.e., the radar's capacity to detect the difference between two objects on the same bearing) far below the thresholds cited in the other entries of XI(a)(3).

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April 13, 2018

By E-Mail (DDTCPublicComments@state.gov)

Directorate of Defense Trade Controls
Office of Defense Trade Controls Policy
U.S. Department of State
14th and Pennsylvania Avenue, NW
Washington, D.C. 20230

Attn: Engda Wubneh

RE: Total Petrochemicals & Refining USA, Inc.
Comments Regarding Review of UMSL Category V
DOS-2017-0017

Dear Ms. Wubneh:

On behalf of Total Petrochemicals & Refining USA, Inc. ("TPRI" or the "Company"), we respectfully submit the following information for the U.S. Department of State, Directorate of Defense Trade Controls' ("DDTC's") consideration regarding changes to export controls for Hydroxyl-Terminated Polybutadiene ("HTPB"), which is controlled pursuant to United States Munitions List ("USML") Category V of the International Traffic in Arms Regulation ("ITAR") and Commerce Control List ("CCL") Category 1 of the Export Administration Regulations ("EAR"), pursuant to the Missile Technology Control Regime ("MTCR") Annex.

In accordance with DDTC's Notice of Inquiry in the Federal Register dated Feb. 12, 2018,[1] we provide important comments to DDTC as part of its review of the controls implemented in recent revisions to, among other things, Category V of the USML. This inquiry is part of a series of solicitations from DDTC requesting feedback on USML categories revised in stages over the past several years.[2] TPRI welcomes DDTC's efforts to continue the reform efforts undertaken as part of the Export Control Reform Initiative ("ECR"). Category V of the USML, for example, was last revised on 2014 and is ripe for review at this point in time to ensure that its controls continue to advance the national security and foreign policy objectives of the United States.[3]

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[1] *See* "Notice of Inquiry; Request for Comments Regarding Review of United States Munitions List Categories V, X, and XI," 83 Fed. Reg. 5970 (Feb. 12, 2018).

[2] *See* "Revisions to the United States Munitions List," 75 Fed. Reg. 76,935 (Dec. 10, 2010).

[3] *See* "Amendment to the International Traffic in Arms Regulations: Third Rule Implementing Export Control Reform," 79 Fed. Reg. 37,536 (Jan. 2, 2014, effective July 1, 2014). *See also* "Amendment to the International Traffic in Arms Regulations: Revision of U.S. Munitions List Category V [Proposed Rule]," 77 Fed. Reg. 25,944 (May 2, 2012).

I. Background of the Company

Total Petrochemicals & Refining USA, Inc. is headquartered in Houston and is a major producer of polypropylene, polystyrene, styrene, base chemicals and polyethylene in the United States. With hundreds of employees and multiple manufacturing facilities in the United States, TPRI is a leading global supplier of hydrocarbon resins, diene-based resins, and specialty monomers. The Company produces a variety of grades of resins at its facility in Channelview, Texas, that are classifiable within ECCN 1C111.b.2. While the company also manufacturers a military grade HTPB product that is subject to ITAR-control,[4] nearly all of TPRI's sales are for use in commercial applications, such as: adhesives; asphalt modification; coatings (containment, can) and waterproofing membranes; insulating gels; oxygen scavenging in plastics; potting compounds and encapsulants; rollers; and, sealants (insulated glass sealants). HTPB resin products are a staple of the manufacturing process for a range of commercial sectors, from automotives to electronics. Apart from the high-grade HTPB controlled on the USML, all other varieties of HTPB are controlled on the Commerce Control List ("CCL") of the EAR as Export Control Classification Number ("ECCN") 1C111.b.2, in accordance with the MTCR Annex.[5]

II. Overview of HTPB Uses and Availability

In accordance with its extensive array of commercial uses, today HTPB is widely available and is manufactured in every continent. Publicly available information reflects that HTPB manufacturing plants are currently located in Italy, Japan, China, South Korea, South Africa, Russia, Czech Republic, and a manufacturing plant has recently opened in Germany. The technology for production of HTPB has been publicly available since the publication of a patent for Burke, Jr. et al. (Patent No. 3,673,168, published on June 27, 1972), and the production process uses raw materials which are also readily available.

Despite its widespread foreign availability, the EAR requires U.S. exporters and reexporters to obtain a standard license under Part 748 to authorize each export or reexport of HTPB to any country destination except Canada, regardless of the amount or value or HTPB to be shipped, or the identity of the proposed end-user. Additionally, because HTPB is controlled

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[4] Category V of the USML controls explosives and energetic materials, propellants, Incendiary agents, and their constituents. Among these, subcategory (e) controls binders, and mixtures thereof, including "HTPB (hydroxyl-terminated polybutadiene) with a hydroxyl functionality equal to or greater than 2.2 and less than or equal to 2.4, a hydroxyl value of less than 0.77 meq/g, and a viscosity at 30 °C of less than 47 poise (CAS 69102-90-5) (MT)." *See* 22 CFR Part 121, Cat. V(e)(7).

[5] BIS recently revised ECCN 1C111 to make minor conforming changes to the controls for HTPB. *See* "Revisions to the Export Administration Regulations Based on the 2016 Missile Technology Control Regime Plenary Agreements," 82 CFR 31442 (July 7, 2017).

for MT reasons, the license exceptions within Part 740 of the EAR do not apply.[6] Thus, U.S. companies are required to obtain a standard export license prior to exporting even a sample, limited volume shipment of HTPB to potential customers, whether research institutions in Europe or TPRI-affiliated entities. This approach to licensing raises numerous business challenges for the Company as a U.S. manufacturer of HTPB seeking to meet foreign customer's expectations, as demonstrated through the following examples:

- Scenario 1: A derivative of HTPB can be used in can coatings. This requires HTPB to be transferred from a warehouse in one country to an outside production facility in another country. Once the derivative is complete, the material is transferred back to the initial warehouse (again, across country borders) prior to shipment to the customer. The customer, in this developing new field is trying to commercialize in several European countries, reacting to the fluidity of the market. However, under the EAR, every potential supply possibility must be detailed in advance and set forth in a license application.

- Scenario 2: Customer A uses HTPB in their Automotive Sealing compound in Germany. To follow their customer's manufacturing to Brazil, Customer A wishes to get a sample of HTPB shipped to their plant in Brazil. Regardless of the quantity requested, this transaction requires a license. The delay in the U.S. company's ability to deliver even small amounts while there is developmental momentum stalls many projects.

- Scenario 3: In "Slow-Growth Markets," mergers and acquisitions are increasingly common. Customer A (who has current active licenses from BIS for exports to Germany), buys Customer B (who has a current active license from BIS for exports to France). Customer A decides that Customer B will now be known as Customer A France. Although both locations have been reviewed and licensed by BIS, Customer B's license is no longer valid and Customer A France does not have a valid license. The U.S. company cannot service Customer A France without requesting a new license from BIS.

- Scenario 4: A U.S. company is storing drums of HTPB at a warehouse in Europe which is listed within the scope of a BIS Export License. That warehouse has a fire; other undamaged company materials in this warehouse are transferred *en masse* to another warehouse approximately 100 miles away that is managed by the same warehouse operating company, so most customers are unaffected. Although no HTPB is damaged, the HTPB cannot be transferred to the second warehouse because the alternate warehouse is in another country (Netherlands to Belgium), which would violate the terms of the BIS export license. Therefore, the U.S. company's customers are negatively affected.

[6] 15 C.F.R. § 740.2(a)((5)(i).

As these actual scenarios demonstrate, the U.S. approach to licensing restricts the ability of U.S. companies to meet potential purchasers' requirements, and deprives U.S. companies of the flexibility needed to address unexpected supply chain issues. Consequently, as explained below, U.S. industry faces commercial disadvantages, particularly when compared with their European competitors who are subject to less onerous licensing policies.

Therefore, on behalf of TPRI we request that, in its review of Category V controls on high-grade HTPB, consideration also be given to the larger system of controls governing the export of all varieties of HTPB from the United States. In particular, the Company is seeking amendment of Category II, Item 4.C.5.b of the MTCR Annex to: (1) Reflect the revisions incorporated into the Coordinating Committee on Multilateral Export Controls ("COCOM") during 1991; or, alternatively, (2) Create an exclusion for sample shipments of HTPB. We provide the following information to inform DDTC's consideration of each proposal.

III. Amendment of the MTCR Annex to Reflect Updates to the COCOM Dual-Use List

A historical analysis of the evolution of the Wassenaar Dual-Use Goods List demonstrates that while the Coordinating Committee on Multilateral Export Controls ("COCOM") removed non-military grade HTPB from the list of dual-use items during the early 1990s, this amendment was not later incorporated into the MTCR Annex. *Compare* COCOM Dual-Use List, 1.C.8.k (Mar. 1991), *with* Wassenaar Dual-Use List, 1.C.8 (Oct. 2017).[7]

For the following reasons, the Company respectfully request that DDTC consider submitting a U.S. proposal to amend the MTCR Annex to reflect the revision incorporated by the COCOM members in 1991.

- **Wide Foreign Availability**. As noted above, HTPB is widely manufactured outside the United States. Additionally, the technology to make HTPB is publicly available in technical papers and patents. Further, virtually all (greater than 95%) of the non-military grade HTPB is used for commercial applications. For the Company, non-military grade HTPB is primarily sold to commercial accounts in U.S. ally countries. Therefore, removing non-military grade HTPB from the MTCR Annex would allow BIS and other U.S. agencies to focus resources on exports of more sensitive items, and to higher risk end-users and end-country destinations.

[7] The Wassenaar Munitions List at ML8.e.12 still controls "HTPB (hydroxyl terminated polybutadiene) with a hydroxyl functionality equal to or greater than 2.2 and less than or equal to 2.4, a hydroxyl value of less than 0.77 meq/g, and a viscosity at 30°C of less than 47 poise (CAS 69102-90-5). *See also* 22 CFR Part 121, Cat. V(e)(7).

- **Compliance with License Requirements**. The Company submits a sizeable number of export license applications for approval (approximately 190 active licenses per year). As noted, removing this licensing requirement would enable BIS to focus its resources on items of higher sensitivity.

- **Lost Sales and Revenue**. The indirect costs to the Company arising from the control of non-military HTPB include loss of business for HTPB manufactured in United States. Non-military HTPB is readily available throughout the world, and is manufactured in plants in numerous countries, including at least three facilities in Europe. Since many of these countries, including numerous MTCR Partners, do not maintain the licensing requirements implemented under the EAR, foreign customers have a wide selection of alternative sources for the material, many of which do not necessitate compliance with the export licensing hurdles imposed under the EAR.

- **Negative Implications for U.S. National Security**. The continued unilateral imposition of stringent export licensing on HTPB by the United States may have negative effects on U.S. national security. This is due to the fact that the Company's sales of military-grade HTPB are insufficient to keep the Company's U.S. facilities for the manufacture of HTPB in operation. The Company relies upon revenue from its commercial sales of non-military HTPB to fund its facilities and related operations. In addition, over 60% of the Company's sales of commercial HTPB are exported. Therefore, the business would not have sufficient volume to remain profitable, much less to generate a return to maintain the facility, even if we retained 100% of the domestic (U.S.) sales of commercial HTPB and all sales of ITAR-grade HTPB, but lost a significant part of the export sales of non-military grade HTPB. Thus, the Company's competitive disadvantage vis-a-vis foreign manufacturers may ultimately jeopardize the viability of its U.S. facility, which also makes the ITAR-controlled HTPB products that are supplied to the U.S. and worldwide military aerospace industry.

IV. Creation of License Exclusion for Sample Shipments of HTPB

Alternatively, TPRI respectfully requests that DDTC coordinate with BIS to consider a proposal to revise the MTCR Annex to include an exclusion for sample shipments of non-military grade HTPB. In support of this proposal, we assert the following additional points, to supplement those set forth above, regarding the potential impact for TPRI.

- Samples (several pounds to several drums) are required to develop any new business. The demand for sample volumes of HTPB is customary within the industrial adhesives, coatings and encapsulant industries for the performance of Quality and Assessment screening. Frequently, the Company does not have the opportunity to file a license application with BIS, as foreign customers are often reluctant to file a BIS Form 711,

Statement by Ultimate Consignee and Purchaser at the proof-of-concept stage, or to wait for several months to obtain the sample. This disadvantage is reflected in the current low volume of license applications submitted to BIS for sample shipments.

- Value of license applications is also a particularly poor metric for assessing the value of this exemption, since a customer sample can often be valued at less than US$100, while the subsequent commercial order could be substantial.

- Additionally, foreign customers typically want to obtain the sample quickly to avoid delays in their development and acquisition planning process. The sample licensing requirement results in a loss of business for TPRI's U.S. production facilities to local HTPB suppliers or to alternative systems. For instance, TPRI has not applied for a sample license to ship HTPB directly to its affiliated labs in France, which have greater analytical capabilities, because the needs are not ongoing and consistent. As a result, when the Company needs to send a sample of HTPB, the Company sends it through the warehouse in Europe instead of sending it directly, which is more costly and time consuming.

- The U.S. licensing requirements for sample shipments place U.S. manufacturers at a substantial competitive disadvantage, in light of the less stringent export laws implemented in other MTCR Partner countries. For example, at least one European country allows the unlicensed export of HTPB in amounts below €5,000 to almost all country destinations. Amending the MTCR Annex to include the license exemption would ensure a level playing field for manufacturers exporting from all MTCR Partner countries, at least with respect to sample shipments.

- Low quantities of HTPB, such as those below 4,000 kilograms, do not pose a risk of missile proliferation. We understand that more than this amount of HTPB binder is required to create even one large booster rocket. In light of the low security risk, U.S. government and industry resources could be better spent controlling more sensitive materials that pose a higher security risk.

V. Conclusion

We appreciate DDTC's efforts to receive and respond to feedback in order to level the regulatory playing field, maintain the U.S. industrial base, and enhance U.S. national security.

Lindsay B. Meyer of Venable LLP has been authorized by the Company to act on its behalf. Questions about these comments should be addressed to the undersigned, who may be reached by telephone at 202-344-4829 or by e-mail at LBMeyer@Venable.com.

Thank you for your consideration of the above.

Respectfully yours,

Lindsay B. Meyer
Wes S. Sudduth
Counsel for Total Petrochemicals & Refining USA, Inc.

cc: Chuck Mateer
Total Petrochemicals & Refining USA, Inc.

Doc.20386881

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United Technologies

Submitted Via Email

April 13, 2018

Mr. Richard Koelling
Acting Director, Office of Defense Trade Controls Policy
Directorate of Defense Trade Controls
U.S. Department of State

Re: Notice of Inquiry; Request for Comments Regarding Review of United States Munitions List Categories V, X, and XI: (83 Fed. Reg. 5970, February 12, 2018)

Dear Mr. Koelling:

United Technologies Corporation (UTC) appreciates the opportunity to submit these comments with respect to United States Munitions List (USML) Categories V (*Explosives and Energetic Materials, Propellants, Incendiary Agents, and Their Constituents*), X (*Personal Protective Equipment*), and XI (*Military Electronics*). The sections below address UTCs recommendations with respect to USML Category XI.

1. XI(a)(11)

USML subparagraph XI(a)(11) controls: "*Test sets specially designed for testing defense articles controlled in (a)(3), (a)(4), (a)(5), or (b).*" UTC points out that the term "test sets" is undefined and not otherwise used in the International Traffic in Arms Regulations (ITAR) and USML, and therefore, promotes confusion with regards to the jurisdiction and classification of the items controlled.

In 2017, UTC submitted commodity jurisdiction (CJ) number 0461-17 requesting the jurisdiction of a Laser Diode Pulser (LDP). CJ 0461-17 was submitted to determine whether the LDP, which UTC considered to be test equipment that tests various Laser Warning Systems (LWS) controlled in USML subparagraph XI(a)(4), was a "test set" for purposes of subparagraph XI(a)(11). Although the CJ 0461-17 determination did confirm the LDP was a "test set," it did not provide any general principle that UTC, or industry, could use in the future to determine whether other items satisfy the definition of a "test set." The lack of clarity surrounding the term "test set" may lead to over or under classification of items, and/or prompt industry to seek item-by-item classifications rather than self-classify.

To address the lack of clarity created by using an undefined term in control language, UTC suggests that DDTC replace "test sets" with "test equipment." Although "test equipment" is not

defined, the term "equipment" is defined. *See* 22 C.F.R. §120.45(h). UTC believes that inclusion of the term "equipment" in the control language provides enough clarity for industry to accurately determine whether an item is captured in USML subparagraph XI(a)(11).

Alternatively, UTC recommends that DDTC define the term "test sets" directly in the control language of subparagraph XI(a)(11) or in a corresponding note. A local definition will assist industry in classifying items appropriately.

2. *XI(c)(2)*

   a. *Order of Review*

In accordance with the USML's Order of Review, an item described in two subparagraphs should be classified in the enumerated subparagraph ahead the specially designed catch-all subparagraph. *See* 22 C.F.R. §121.1(b). The Order or Review *does not* provide guidance with regards to the classification of an item described in two enumerated subparagraphs, or alternatively, two catch-all paragraphs. The absence of guidance in the Order of Review to address the aforementioned situations creates confusion when classifying printed circuit boards (PCBs) and populated circuit card assemblies (PCCAs) described in subparagraph XI(c)(2) and a second enumerated subparagraph, such as VIII(h)(3).

For example, a PCCA specially designed for a USML Category VIII helicopter automatic rotor blade folding system's utility management system is described in two subparagraphs. The PCCA is described in subparagraph VIII(h)(3), which controls specially designed parts and components of automatic rotor blade folding systems. The PCCA is also described in subparagraph XI(c)(2), which controls PCBs and PCCAs for which the layout is specially designed for a defense article. Both paragraphs appear to contain a catch-all for specially designed parts and components. As such, the Order of Review guidance (*i.e.*, classify in an enumerated entry before a catch-all entry) cannot be applied. In this case, absent clear direction in the Order of Review, industry is left to make a judgement call as to whether the PCCA specially designed for a USML helicopter rotor blade folding system should be classified in subparagraph XI(c)(2) or VIII(h)(3).

In its October 2016 final rule (Final Rule) amending Category XII (*Fire Control, Range Finer, Optical and Guidance Control Equipment*), it appears that DDTC addressed the classification of items described in two presumably enumerated paragraphs. In its Final Rule, DDTC stated that a subparagraph with more specifically described controls take precedence over one with general catch-all controls. *See* 81 Fed. Reg. 70340, 70352 (*DDTC determined that the control language in subparagraph XII(e)(19) is more specifically described than the control language in XI(c), and therefore, PCCAs should be classified in XII(e)(19)*). DDTC's response resembles the general guidance in the Order of Review; however, DDTC's response did not establish a bright line rule that forces consistent classifications throughout industry when determining the more appropriate classification when two enumerated (or catch-all) subparagraphs are involved. Specifically, DDTC's response did not offer clear factors in which industry should consider in determining the appropriate classification of an item that is described in two enumerated (or catch-all) subparagraphs.

UTC understands that subparagraph XI(c)(2) is intended to ensure that PCBs and PCCAs specially designed for defense articles, that would otherwise transition to the Export Administration Regulations' (EAR) Commodity Control List (CCL), are captured on the USML. If this is DDTC's intent, UTC recommends that DDTC include a second note to subparagraph XI(c)(2) to state that PCBs and PCCAs specially designed for a defense article in another category, and described in a subparagraph of that category (for example, in the "parts and components thereof" catch-all portion of the entry), are controlled in that subparagraph. The second note would also state that PCBs and PCCAs specially designed for a defense article in another category, but not described in a subparagraph in that category, are controlled in XI(c)(2).

This recommendation is consistent with the approach the Bureau of Industry and Security (BIS) took with respect to PCBs and PCCAs specially designed for platforms outside of CCL Category 3. *See* 15 C.F.R. Part 774, Supplement No. 1 (*Export Control Classification Number (ECCN) 3A611, Related Controls Note 6, Electronic components not enumerated on the USML or "600 series" that are specially designed for a military aircraft are controlled in ECCN 9A610.x, not 3A611.g*). Further, the recommended note to subparagraph XI(c)(2) provides guidance that is more easily understood than the "more specifically described" guidance articulated in the Final Rule. Most importantly, the proposed note ensures that PCBs and PCCAs specially designed for defense articles are captured on the USML.

If DDTC does not accept this recommendation, UTC recommends that DDTC better define the "more specifically described" standard articulated in the Final Rule in the USML's Order or Review or locally in Category XI. A more robust and codified definition will help ensure accurate classification of PCBs and PCCAs throughout industry.

b. Critical Military or Intelligence Advantage

In accordance with Section 120.3(b) of the ITAR, an item should be controlled on the USML when it provides a critical military or intelligence advantage. UTC does not believe that a critical military or intelligence advantage is provided by PCBs and PCCAs that are designed to carry: (1) no components; or (2) passive components only. As such, UTC believes that DDTC should revise the control language in subparagraph XI(c)(2) to ensure that only PCBs and PCCAs designed to incorporate active components are controlled. PCBs and PCCAs that are not designed to incorporate active components should be controlled in a "600 series" ECCN.

PCBs and PCCAs designed to carry no components provide no critical military or intelligence advantage. These PCBs and PCCAs are used as interconnectors and operate as a rigid extension for flexible cables or harnesses. In other words, the PCBs and PCCAs are similar to cables and harnesses, which are not controlled on the USML. In this capacity, PCBs and PCCAs provide no critical military or intelligence advantage, and therefore, should not be controlled on the USML.

PCBs and PCCAs designed to carry passive components (*e.g.*, noise-suppressing inductors, decoupling capacitors, etc.) are not materially different from PCBs and PCCAs designed to carry no components. They are primarily used as interconnectors and operate as a rigid extension for flexible cables or harnesses. The addition of passive components does not significantly enhance

the military or intelligence advantage of the PCB or PCCA, and therefore, PCBs and PCCAs designed to carry only passive components should not be controlled on the USML.

PCBs and PCCAs that are designed to carry active components (*e.g.*, transistors, integrated circuits, etc.) for which the layout is specially designed for defense articles, are materially different from the PCBs and PCCAs discussed above. PCBs and PCCAs designed to carry active components are used to control current or voltage by means of electrical signals. As such, they could provide a significant military advantage, and therefore, when the layout is specially designed for a defense article, should be controlled on the USML.

To avoid controlling PCBs and PCCAs that provide no critical military or intelligence advantage, UTC recommends that DDTC revise control language in subparagraph XI(c)(2) to read:

> "*(2) Populated and unpopulated Printed Circuit Boards (PCBs) and printed circuit card assemblies (PCCAs) designed to carry active components, for which the layout is specially designed for defense articles in this subchapter.*"

The revised control language would ensure that PCBs and PCCAs designed to carry active components remain controlled on the USML, while those that are not designed to carry active components transition to the CCL.

3. XI(c)(3)

The term "multichip module" is used in USML subparagraph XI(c)(3) control language as well as the corresponding note. The term multichip module is not a defined term and, therefore, is open to interpretation throughout industry. To increase clarity as to what items are controlled in subparagraph XI(c)(3), UTC recommends defining "multichip modules" in a second note to subparagraph XI(c)(3), using the definition of "multichip microcircuit" that is found in Military Specification MIL-H-38534: "*A microcircuit consisting of elements formed on or within two or more semiconductor chips which are specifically attached to a substrate or package.*"

4. XI(c)(15)

Subparagraph XI(c)(15) controls "*Electronic assemblies and components, capable of operation at temperatures in excess of 125°C and specially designed for UAVs or drones controlled by USML Category VIII, rockets, space launch vehicles (SLV), or missiles controlled by USML Category IV capable of achieving a range greater than or equal to 300 km (MT).*" UTC believes that the control language in XI(c)(15) inadvertently controls items with no military or intelligence advantage. Specifically, the use of the phrase "*capable of operation*" in the control language referencing temperatures greater than 125°C leads to the inadvertent control of items.

Items are designed to operate to certain performance characteristics (*e.g.*, at or below 125°C). Although a specific item is designed to operate to certain performance characteristics, the item, or a small percentage of the item, for various reasons, could be *capable of* operating outside the intended performance characteristics.

For example, a microcircuit designed to operate at temperatures at or below 125°C could, in some circumstances (*i.e.*, when pushed beyond its intended capabilities), be *capable of* operating above 125°C. As another example, due to manufacturing tolerances, a percentage of manufactured microcircuits designed to operate at temperatures at or below 125°C could be *capable of* operating above the temperature. In both examples, the microcircuits are not designed or intended to operate above the threshold temperature, but could, in some circumstances, be capable of operating above the threshold. Therefore, the microcircuits would be unintentionally captured in subparagraph XI(c)(15) because they are capable of, but not designed to, operate above 125°C.

UTC does not believe it is DDTC's intent to control electronic assemblies and components in XI(c)(15) unless they are knowingly designed and intended to operate above the temperature threshold. As such, UTC recommends that DDTC replace "*capable of operation*" with "*designed or specified to operate.*"

UTC also believes that DDTC can support proper classification of electronic assemblies and components that are not classified in XI(c)(15) by adding a note referring industry to ECCN 3A001.a.2.a for items not controlled in XI(c)(15). To that end, UTC recommends a note reading:

> "***Note to paragraph (c)(15):*** *Electronic assemblies and components, designed or specified to operate at temperatures in excess of 125 °C that are not specially designed for the defenses articles described in (c)(15) are controlled in ECCN 3A001.a.2.a.*

* * *

If you have any questions regarding these comments, please contact Andrew Hayes at (202) 336-7478 or andrew.hayes@utc.com or Jon Schwank at (704) 998-6893 or jon.schwank@utas.utc.com.

Sincerely,

Peter S. Jordan
Executive Director & Associate General Counsel, International Trade Compliance
United Technologies Corporation

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April 9, 2018

U.S. Department of State
Bureau of Political and Military Affairs
Office of Defense Trade Controls
PM/DTC, SA-1
2401 E Street, N.W., Suite 1200
Washington, DC 20522-0112
Submitted electronically via e-mail

Attn: Mr. Richard Koelling, Acting Director, Office of Defense Trade Controls Policy, Bureau of Political-Military Affairs, U.S. Department of State

Re: DOS-2017-0017
Request for Comments Regarding Review of United States Munitions List Categories V, X, and XI

Dear Mr. Koelling,

Viasat is a provider of digital satellite communications and other wireless networking and signal processing equipment and services to global markets. Viasat develops and manufactures satellite ground network systems and other related digital communications equipment. Products include satellite networks and antenna systems, data link terminals, information security for networking, mobile IP networking, communications microprocessor chipsets, and communications simulation and training systems. Viasat is headquartered in Carlsbad, California. Additional information about Viasat is available at www.Viasat.com.

Viasat appreciates the opportunity to provide the following comment to the notice of inquiry requesting comments regarding review of United States Munitions List ("USML") Categories V, X, and XI. The notice of inquiry requested comments on six specific topics, some of which will be addressed by Viasat herein, specifically drafting or other technical issues in the text of the referenced categories.

Comment Areas

1. **XI(a)(5)(i)** – As written, USML control paragraph XI(a)(5)(i) is intended to capture C3, C4, and C4I systems and equipment that are specially designed to integrate, incorporate, network, or employ defense articles (a) elsewhere mentioned, and (b) that do not rely upon specially designed and treats the items captured as Significant Military Equipment (SME).

   A system captured under this control may be comprised of many elements, all of which maintain their own individual USML and/or ECCN classification. Viasat designs and

manufactures items subject to the both the ITAR and EAR and frequently delivers specially configured systems to that integrate and incorporate items of many classifications to its customers. These items, when delivered on their own, may be eligible for license exceptions, license exemptions, or may be free of certain documentation requirements. However, when assembled, this system is considered SME and a DSP-83 is required as support documentation for any permanent export. Was it DDTC's intention to treat assembled systems that may not achieve any enumerated USML capability, characteristic, or functionality as SME?

Viasat asks that DDTC confirm whether or not items that would ordinarily not be labeled as SME and merit the burden of a DSP-83 individually should warrant that level of documentation support when configured as a system.

2. **XI(a)(7)** – The stated control under USML XI(a)(7) captures those systems and equipment that are in a status of development which is funded via Department of Defense contract or other funding authorization. The corresponding Note 1 states that items that are in production are not subject to control under this paragraph

   Even though a system may be generated for the first time under a certain DoD funding mechanism, it may be entirely made up of items that are already in production but have never been together in a specific configuration before. Does this act of integration cause these items to re-enter a state of development? We believe this to not be the case as they are already in serial production, but what about the system? Would DDTC consider the system to be in development, despite the constituent assemblies being in production?

   Viasat asks that DDTC clarify the relationship between a system and its constituent parts as it relates to the status of development.

3. **XI(a)(11)** – USML control paragraph XI(a)(11) captures test sets specially designed for items controlled under USML XI(a)(3)-(a)(5) and XI(b).

   The phrase "test set" is not a defined term in part 120 or any other section of the ITAR. This ambiguous wording could lead one to place any item used for testing items captured under XI(a)(3)-(5) and XI(b) under XI(a)(11), and would seem to negate the applicability of ECCN 3B611 for these items. Additionally, this read of XI(a)(11) would seem to run contrary to the stated goals of Export Control Reform (ECR). Does DDTC consider all test items for the defense articles listed to be treated equally, even though some may test the core functionalities, while others may be somewhat innocuous test items? And how should one apply XI(a)(11) when an item can be used for both test and normal operation? Should such an item be treated as a test set, or can industry default to defined terms such as part, component, accessory, and attachment?

   Viasat asks that DDTC revise XI(a)(11) to clearly state the types of test equipment to be captured, provide a clarification note to the USML control paragraph, or rely upon the defined item types in part 120.

4. **XI(b)** – The text of USML XI(b) controls systems, equipment, and software specially designed for intelligence purposes that collect, survey, monitor, or exploit, or analyze and produce information from, the electromagnetic spectrum (regardless of transmission medium), or for countering such activities.

An oft-stated goal of ECR was the reliance upon technical characteristics, capabilities, and functionalities to determine the nature of a defense article, rather than end use or application. There was, however, the recognition that not all technical parameters could or should be shared, depending upon the nature and sensitivity of the control paragraph in question. In this instance, specially designed was to be relied upon. This use of specially designed generally utilized a connection to a specific platform (see VIII(h)1)) or a given defense article (see XV(b)). USML XI(b) does not rely upon such a relationship however. Instead, the use of such equipment for a stated purpose, and not necessarily the functionality of it, is what drives the language of the control paragraph.

Viasat asks that DDTC utilize technical thresholds to determine the status of defense articles, or if specially designed must be use, to rely upon a defined relationship rather than create an end use control within the USML.

5. **XI(c)(4)** – Transmit/receive modules and transmit modules with any two perpendicular sides, with lengths lower than a size dictated by the lowest operating frequency, with an electronically variable phase shifter or phasers that are a MMIC or incorporate a MMIC or discrete RF power transistor are the target of USML control paragraph XI(c)(4).

   This control achieves the goal of ECR by relying upon technical parameters to control a specific technology, however this control overlaps with a control on the Commerce Control list (3A001.b.12), which would seem to suggest that there is an international recognition that this capability has both a military and civil application due to the origin of this control in the Wassenaar Arrangement. Additionally, Viasat does not believe the technical parameters utilized in this control accurately distinguish between critical military technologies and those with commercial applications, such as next-gen communications (5G, satellite).

   Viasat asks that DDTC revise the control to account for the development of commercial applications utilizing the devices controlled currently via a modification of the parameters in the control or the use of specially designed to clearly identify the applications of concern.

6. **XI(c)(10)** – Antennas with various capabilities are captured under USML paragraph XI(c)(10) and its subparagraphs.

   Viasat believes the controls established in these paragraphs were intended to capture antennas with a specific application, however technological progression has now led this control to impact the development of commercial technologies. Specifically, the controls listed in XI(c)(10)(i) and (ii) list capabilities that have use in antennas for communications applications. XI(c)(10)(i) relies upon functionalities of nulls and beam switching speed to set the control thresholds, but nulls are required for communications antennas to reduce interference with other radio operators, and quick beam switching speed is necessary for mobile applications. XI(c)(10)(ii) again states a capability centered on employing nulls, which are necessary to reduce potential interference in communications applications.

   Viasat asks that DDTC review the control thresholds in XI(c)(10) for overlap with commercial communications applications and revise the control to more accurately regulate those antennas that warrant control under the ITAR.

Conclusion

As requested in the notice of inquiry, Viasat has provided information related to the review of United States Munitions List Category XI and sought specific revisions, clarifications, and reviews of USML control paragraphs.

If you require any further information, please contact me at (760) 893-2918 or via email at joshua.millan@Viasat.com.

Sincerely,

Viasat, Inc.

Joshua Millan
Global Trade Compliance